THE BOARD OF COUNTY COMMISSIONERS
OF FREDERICK COUNTY, MD

PROCUREMENT & CONTRACTING DEPARTMENT
12 East Church Street, Winchester Hall
Frederick, Maryland 21701

INVITATION FOR BID (IFB) #14-049-CP

LANDFILL STORMWATER PUMP STATIONS IMPROVEMENTS FREDERICK COUNTY CONTRACT NO. SW0745

PROJECT SPECIFICATIONS

Buyer: Tim Kepp
Phone: (301) 600-6702
Fax: (301) 600-2521
Email: tkepp@frederickcountymd.gov

www.FrederickCountyMD.gov

Issue Date: November 2013

National Purchasing Institute

LANDFILL STORMWATER PUMP STATIONS IMPROVEMENTS

PERTINENT INFORMATION SUMMARY

IFB Number:	IFB 14-049-CP
IFB Name:	Landfill Stormwater Pumping Station Improvements
Issue Date:	November 12, 2013
Buyer:	Tim Kepp, PE tkepp@frederickcountymd.gov 301-600-6702
Pre-Bid Date:	November 20, 2013 at 9:00 a.m.
Pre-Bid Location **Site Visit**	Department of Procurement & Contracting Winchester Hall, First Floor 12 East Church Street Frederick, MD 21701 At Site Immediately following Pre-Bid Meeting
Questions Due and to Whom:	Questions due no later than 4:00 PM on December 2, 2013 Submit questions to Tim Kepp, PE at tkepp@frederickcountymd.gov
IFB Due:	December 11, 2013 at 2:00 p.m.
Mail/Deliver Bids to the Issuing Office:	Department of Procurement & Contracting Winchester Hall, First Floor 12 East Church Street Frederick, MD 21701 301-600-1067 **THE COUNTY ASSUMES NO LIABILITY FOR MAILED BIDS. All bids received after the opening time will be rejected and returned unopened to the bidder.**
Bid Guaranty	5%
Performance Bond: **Labor & Material Payment Bond:**	100% of contract amount 100% of contract amount

IMPORTANT NOTICE REGARDING ADDENDA

Addenda to solicitations often occur prior to solicitation due date.
It is the potential Contractor's responsibility to visit the
Department of Procurement & Contracting web site for updates to solicitations.
www.frederickcountymd.gov/procurement

FREDERICK COUNTY PROJECT NO. SW0745
LANDFILL STORMWATER
PUMP STATIONS IMPROVEMENTS

PROJECT SPECIFICATIONS
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FREDERICK COUNTY DIVISION OF UTILITIES AND SOLID WASTE MANAGEMENT
DEPARTMENT OF ENGINEERING & PLANNING
4520 METROPOLITAN COURT
FREDERICK, MARYLAND 21704

BID # 14-049-CP

INVITATION TO BID

Notice is hereby given that sealed Proposals will be received by the Frederick County Procurement and Contracting Department, Winchester Hall, 12 East Church Street, Frederick, Maryland 21701 for:

Landfill Stormwater Pumping Station Improvements
Frederick County Contract #SW0745

Work under this contract includes the following:

1. Installation of a new power and control system for two existing dry well storm water pump stations. The new electrical systems will be installed above grade and covered by a pavilion at the two sites.
2. Replacement of five (5) dry pit submersible pumps total between the two pump stations.
3. Miscellaneous site work, including, but not limited to, installation of a gravel apron around the pavilions, relocation of sump pump piping, and general site restoration.

A **Pre-Bid Meeting** will be held on **November 20, 2013 at 9:00 AM,** local time in the Procurement and Contracting Department conference room, Winchester Hall, 12 East Church Street, Frederick, Maryland. The purpose of the conference is for answering questions, reviewing specifications, and terms and conditions, or considering any other issues raised by the attendees relating to this contract

A site visit for both pump station sites at 9031 Reichs Ford Road, Frederick, MD 21704 will follow the pre-bid meeting. There will be no additional site visits scheduled after the pre-bid meeting site visit.

Sealed Proposals for the for this project will be received by the Frederick County Department of Procurement and Contracting, Winchester Hall, 12 East Church Street, Frederick, Maryland, until **2:00 PM**., local time, on **December 11, 2013** at which time and place they will be opened publicly and read in the Procurement and Contracting Conference Room, Winchester Hall, 12 East Church Street, Frederick, Maryland. Refer to Information to Bidders for bid submission requirements.

There is no charge for the bid documents. Downloading the Contract Documents will permit the bidder to take the Contract Documents to the “print shop” of their choice for printing. Depending on the type/speed of your internet connection, and the size of the file(s), this download could take 20 to 30 minutes or more. For the purposes of bidding, all Contract Documents used for bidding, must be printed in the size and resolution advertised.

Bid documents may be obtained as follows:

- If you are already a registered vendor on the Frederick County Purchasing website:
  - go to our Purchasing Construction Page at:
    http://www.frederickcountymd.gov/index.aspx?NID=1116
    and download a copy of the Bid.

- If you are not yet a registered vendor on the Frederick County website:
  - Go to the vendor registration page at:
    https://ww4.frederickcountymd.gov/VendorSignIn/
    and follow instructions to register.
  - When you have completed registration go to the Purchasing construction page identified above to download a copy of the Bid.

NOTICE: CONTRACTORS and SUBCONTRACTORS THAT DO NOT REGISTER WILL NOT RECEIVE NOTIFICATION OF ADDENDA; THEREFORE, THE COUNTY ASSUMES NO RESPONSIBILITY FOR THE FAILURE OF NON-REGISTERED ENTITIES TO RECEIVE ADDENDA.

No bids will be considered unless accompanied by a certified check, cashier's check or a treasurer's check drawn on a bank or a bid bond payable to the Board of County Commissioners of Frederick County, Maryland, in the amount of 5 percent of the total bid price.

In addition, the successful bidder will be required to furnish a Payment Bond and also a Performance Bond in the full amount of the Contract Award. The successful bidder will be required to give bond and comply with the Acts of the General Assembly of Maryland respecting Contracts.

The Board of Frederick County Commissioners reserves the right to accept or reject any and/or all bids and to waive any informalities or irregularities in the bidding.

Frederick County Government does not discriminate on the basis of race, color, national origin, sex, religion, age and disability in employment or the provision of services.

Individuals requiring special accommodations are requested to contact the Utilities and Solid Waste Division, Department of Engineering and Planning at (301) 600-2078 Voice, (TTY: Use Maryland Relay), to make arrangements no later than ten (10) working days prior to the pre-bid meeting.

BY AUTHORITY OF:

The Frederick County Board of County Commissioners
Diane George, Procurement and Contracting Director

INFORMATION TO BIDDERS

1. Construction Project:

Landfill Stormwater Pumping Station Improvements
Frederick County Contract #SW0745
Bid No. 14-049-CP

2. Owner:

Board of County Commissioners of Frederick County Maryland
Winchester Hall
12 East Church Street
Frederick, Maryland 21701

(Whenever the word "Owner" or "Commissioners" is used it shall mean the Board of County Commissioners of Frederick County, Maryland.)

3. Engineer:

Frederick County Division of Utilities and Solid Waste Management
4520 Metropolitan Court
Frederick, Maryland 21704

Whenever the phrase “the Engineer” or “Engineering Department” appears in the Plans, Specifications or Special Provisions, the bidder shall interpret it to mean the Department Head of the Frederick County Division of Utilities and Solid Waste Management, Department of Engineering and Planning or his designated representative.

4. Bid Documents:

A. Each Bidder is responsible for detailed examination of job-site, drawings, and Specifications and all governing codes and ordinances to ascertain for himself/ herself actual existing conditions, facilities, circumstances, difficulties, restrictions, and requirements, which will affect the work. Each Bidder shall include all the costs involved with the work in his/her Proposal. (The act of submitting a Proposal shall be taken to mean that the Bidder has familiarized himself/herself with the project and that any inadequate examination of Job-site, Drawings, Specifications, or Codes and Regulations shall not relieve the Bidder from full performance of the work.)

B. It is the intent that the Drawings and the Specifications are complete and all inclusive. All work shall be in accordance with the following:

- General Conditions and Standard Specification for Water Mains, Sanitary Sewers and Related Structures
- Standard Details for Water Mains, Sanitary Sewer and Related Structures
- Sanitary Sewer and Water Mains Special Provisions, October 1991, Amended July 20, 2006 Per Resolution 06-30

- Maryland Department of Transportation, SHA, Standard Specifications for Construction and Materials, latest edition, and the issued MD SHA Utility Permit.

(The links to these documents can be found online at: http://www.frederickcountymd.gov/index.asp?nid=1293)

C. Request for a clarification or interpretation of Bidding Documents shall be submitted in writing to the Procurement and Contracting Department by email to tkepp@frederickcountymd.gov **Attention:** Mr. Tim Kepp, Procurement Manager, at least ten (10) calendar days before the established date for receipt of bids. He can also be contacted at 301-600-6702. Responses to requests shall be by addenda as revisions to the Bidding Documents and shall be issued in a reasonable time before the established date for receipt of bids. The Owner will not be responsible for any other clarifications or interpretations, which anyone presumes to make. Requests received within ten (10) calendar days prior to the date of the opening of the bids may not be considered.

D. The Owner reserves the right to revise the Bidding Documents or the Bid Date by issuing Official Addenda to all Bidders during the bidding period.

E. Bidders' Proposal shall be based on Bidding Documents as modified by Official Addenda.

5. Bid Submission:

A. Bids shall be enclosed in one envelope which includes:

- Affidavit of Qualification to Bid
- Affirmative Action Data Form
- Bid Security
- Bidder Certification of Work Capacity
- Certification of Compliance Frederick County Purchasing Regulation 1-2-36 Hiring of Illegal Aliens Prohibited for Performance of County Work
- Joint Venture Eligibility Form (4 pages, as applicable)
- Listing of Subcontractor's
- Non-Collusion Certification
- Proposal Form

Original documents shall be inserted into a single envelope addressed to Frederick *County and identified on the outside as* ***"Stormwater Pumping Station Improvements", Bid No. 14-049-CP*** , with the Bidder Name and address on the outside of the envelope

Bids must be made in accordance with the requirements in the bid documents.

Bidder shall submit his/her bid on the Proposal and Proposal Form provided by the Owner. The Proposal and Proposal Form shall be completely filled in, with all blanks receiving the appropriate information.

B. Erasures or changes in the Proposal and Proposal Form shall be initialed by the Bidder. Unexplained erasures or changes may be cause for bid rejection by Owner. Omissions,

deletions, alterations, qualifying conditions, items not requested, extraneous entries, or other irregularities may be cause for bid rejections.

C. No verbal or telephone bid or modification will be considered. Failure to acknowledge receipt of all Addenda may be cause for bid rejection by Owner.

D. The Proposal and Proposal Form shall be manually signed by authorized principal of firm bidding.

E. In the event of a discrepancy between the unit prices and the extensions (product of quantity and unit price), the unit price will govern. In the case of discrepancy between prices written in words and those written in figures, the written words will govern. In the event that the unit price is not included, the unit price shall be the extended price divided by the quantity.

6. Bid Guaranty:

A. No bid will be considered unless accompanied by a guaranty in an amount not less than 5 percent of the Aggregate Bid Amount for all items included in the Bid Schedule and made payable to **payable to the Board of County Commissioners of Frederick County, Maryland**. Acceptable forms of security for bid guarantee shall be a bid bond in a form satisfactory to the County underwritten by a surety company authorized to do business in Maryland; a bank certified check or bank cashier's check. Such bid security shall be submitted with the understanding that it shall guarantee that the Bidder will not withdraw his/her bid for a period of one hundred twenty (120) calendar days after the closing time for the receipt of bids; that if his/her bid is accepted, he/she will enter into a formal contract with the Owner and that the required performance bond and labor & material bond will be given; and that in the event of the withdrawal of said bid within said period, or the failure to enter into said Contract and give said bonds, the Bidder shall be liable to the Owner for the full amount of the bid guarantee as representing the damage to the Owner on account of the Bidder. The bid security of unsuccessful Bidders will be returned within 30 days following the award of the Contract upon request.

7. Bid Evaluation, Award, Rejection of Individual Bids, Contract Execution:

A. Opening of Bids will take place publicly and bids will be read aloud, following the receipt of bids and at the close of the bidding period.

B. The Owner reserves the right to waive any informality in the bidding, and to accept any bids, or reject any or all bids, or to award the contract to the lowest responsible bidder.

C. It is the intent of the County to receive and evaluate responsive and reasonable bidders on the basis of total bid price, with a complete submission of the Proposal and supporting information described herein, or to make an award the County determines to be in its best interest. The County intends to award the Contract to the successful bidder in the amount of the total bid price of the bid schedule and alternates selected.

D. Any bids submitted which are not in accordance with Paragraph 7 of the Information to Bidders, and Article 35, BID PROPOSAL INFORMATION, of the GENERAL CONDITIONS AND STANDARD SPECIFICATIONS may be rejected by the County.

E. A bidder may be required to submit evidence that he has appropriate experience, personnel, equipment and financial resources available to undertake and perform the Contract properly and expeditiously, and any other information that may be required to indicate his ability to fulfill the Contract. These requirements may also be applicable to subcontractors proposed to perform work for the County's project.

This shall include, but not be limited to, submission of at least three (3) projects of similar size, scope and complexity completed within the last five (5) years, including the completion date, owner's name, authorized representative of the owner familiar with the project, address and phone number. If the bidder performed the work for a project as a subcontractor the general contractor's name, authorized representative of the contractor familiar with the project, address and phone number shall also be provided.

Resumes of principal personnel proposed for the project shall be submitted.

A list of equipment proposed for the project shall also be submitted.

Failure to submit acceptable information that demonstrates the bidder's ability to perform the work, within three (3) days after request from the County may result in a determination that a bidder is not a responsible contractor to perform the work anticipated solely for Bid No.14-049-CP. Failure to submit additional information requested by the County in a timely manner may also result in a determination that a bidder is not a responsible contractor.

F. Subsequent to the evaluation of bids a construction contract may be awarded by the Owner. The Owner reserves the right to reject any or all bids and to waive any informality or deficiency in bids received, whenever such rejection or waiver is in the best interest of the Owner. The Owner also reserves the right to reject the bid of a Bidder who has previously failed to perform properly or to complete, on time, contracts of a similar nature, or the bid of a Bidder, who after investigation, is not, in the view of the Owner, in a position to perform the Contract.

The successful Bidder shall be required to execute a Construction Contract with the Owner and provide the Owner with a Performance Bond and a Labor and Materials Bond for 100% of the Contract, underwritten by a Surety Company acceptable to the owner.

G. The successful Bidder shall be required to provide to the Owner the Insurance listed in the following Section.

8. <u>Bid Protest:</u>

The County's Bid Protest Procedure may be accessed at:
http://www.frederickcountymd.gov/index.aspx?NID=1116.

INSURANCE REQUIREMENTS

CONTRACTORS: Please provide this document to your insurance agent for reference when completing the Certificate of Insurance (COI).

In order to be eligible to provide services to the County that are listed in this RFP, Contractors MUST provide a COI meeting the following insurance requirements prior to starting any work or service and must maintain these requirements for the duration of the contract or business relationship and if specified below, requirements must be maintained for 3 years after the contract or completion of work:

1. **Auto Liability** coverage with minimum limits of $1,000,000 Combined Single Limit, or $1,000,000 each Person, $1,000,000 each Accident, $1,000,000 Property Damage

2. **Workers' Compensation** coverage with minimum statutory limits

    a. Employers Liability coverage with minimum limits of $100,000 per Accident, $100,000 per Employee; and $500,000 per Policy.

    b. **Workers' Compensation and Employers Liability policies must include a Waiver of Subrogation in favor of BOARD OF COUNTY COMMISSIONERS OF FREDERICK COUNTY, MARYLAND.**

    Note: Out of State employers must show evidence of coverage in Maryland by listing Maryland as a covered State and not rely on "other states" coverage. On a Standard Workers' Compensation policy this is typically established in Section 3A of the Declarations Page. Copy of Declarations Page showing evidence of coverage must be provided.

3. **General Liability** coverage with minimum limits of $2,000,000 per Occurrence; $3,000,000 General Aggregate; $3,000,000 Prod/CO Aggregate; $2,000,000 Personal/Advertising Injury; $50,000 Fire Damage Legal Liability and $5,000 Medical Expense

    a. General Liability must cover Premises Operations; Products/Completed Operations; Contractual Liability; Underground/Explosion/Collapse; Independent Contractors; Broad Form Property Damage and Personal Advertising Injury.

    b. **General Liability policy (and any applicable Excess) must include BOARD OF COUNTY COMMISSIONERS OF FREDERICK COUNTY, MARYLAND as Additional Insured and must include a Waiver of Subrogation. Do not use abbreviations or change these words in any way.**

    c. **Additional Insured status must include Premises/Operations and Products/Completed Operations and must be maintained for a minimum of 3 years after completion of contract; or tail coverage must be purchased.**

    d. If General Liability policy has a Self-Insured Retention or Deductible greater than $1,000 you will be required to submit audited financial statements of review.

4. **Riggers Liability – If a Crane will be utilized** - Any project requiring use of a Crane will require, **Crane Operators & Heavy Movers Insurance:** commonly known as "on hook" or Riggers Liability coverage. This policy provides insurance for third-party liability for loss or damage to property while being hoisted by a rigger. The General Aggregate shall be no less than $2,000,000 and $1,000,000 per occurrence. This insurance can be included in the General Liability but certificate of insurance must indicate this coverage. All other insurance requirements will continue to apply.

5. **Builders Risk or Installation Floater** policy with "All Risk" coverage with 100% of materials associated with the job.
   a. Policy must name **BOARD OF COUNTY COMMMISSIONERS OF FREDERICK COUNTY, MARYLAND** as Loss Payee.

PLEASE NOTE THE FOLLOWING:

1. **Any Insurance written on a Claims Made form must indicate retro date.**

2. All policies requiring *Additional Insured* or *Waiver of Subrogation* wording MUST be accompanied by the corresponding endorsements - blanket endorsements are acceptable.

3. All certificates must include an authorized signature and provide for at least 30 days notice of cancellation.

4. All of the above coverages must be written by a carrier with a minimum A.M. Best rating of A- or better AND a financial size classification of VI or higher.

5. Any deductibles or self-insured retentions should be noted on the certificate.

6. Certificates issued on the ACCORD 25 (with revision date prior to 2010/05), or any Certificate that includes the following phrases in the Cancellation wording must have these phrases struck from the Certificate: "endeavor to" and "but failure to mail such notice shall impose no obligation or liability of any kind upon the company, its agents or representatives".

7. If any primary policy's limits fall short of the requirements, be sure to include on the certificate any excess policies that would extend these limits.

8. The Certificate Holder must be:

   Board of County Commissioners of Frederick County, Maryland
   12 East Church Street
   Frederick, MD 21701

NON-COLLUSION CERTIFICATION

The Department of Purchasing requests as a matter of policy that any firm receiving a contract or award from Frederick County, Maryland, shall make certification as below. Receipt of such certification, under oath, shall be a prerequisite to the award of contract and payment thereof.

I (We) hereby certify that if the contract is awarded to our firm, partnership or corporation that no member of the elected governing body of Frederick County, or members of his or her immediate family including spouse, parents or children, or any person representing or purporting to represent a member or members of the elected governing body, has received or has been promised, directly or indirectly, any financial benefit, by way of fee, commission, finder's fee, political contribution, or any similar form of remuneration on account of the acts of awarding and/or executing this contract.

HANDWRITTEN SIGNATURE OF AUTHORIZED PRINCIPAL(S):

NAME: _____

TITLE: _____

NAME OF FIRM/PARTNERSHIP/CORPORATION:
_____

_____

DATE: _____

COUNTY OF FREDERICK
AFFIRMATIVE ACTION DATA FORM

The County of Frederick has established a program to ensure equal opportunity in its project bidding. We are asking you to help us in this effort by completing the Applicant Affirmative Action Data Form below. Completing the Data Form will assist us in monitoring the effectiveness of our program. THIS FORM WILL BE FILED SEPARATELY FROM YOUR BID PROPOSAL AND WILL NOT BE USED TO DISCRIMINATE IN ANYWAY IN THE PROJECT BIDDING OR AWARD PROCESS. The completion of this form is required for your participation and consideration.

1. PROJECT: Landfill Stormwater Pump Stations Improvements

2. DATE: _____

3. NAME OF BIDDER: _____

4. TYPE OF BUSINESS ENTITY:

a. _____ Individual
b. _____ Sole Partnership
c. _____ General Partnership
d. _____ Limited Partnership
e. _____ Limited Liability Company
f. _____ S-Corporation
g. _____ C-Corporation
h. _____ Professional Corporation

5. PERCENTAGE OF OWNERSHIP INTEREST (i.e., 1% - 100%)

a. Based on Ethnic Origin:

1. _____ % White
2. _____ % Black/African-American
3. _____ % Hispanic
4. _____ % Asian
5. _____ % American Indian or Alaska Native

b. Based on Gender:

1. _____ % Male
2. _____ % Female

Note: Ethnic origin is defined by the Federal Equal Employment Opportunity Commission as follows:

American Indian or Alaskan Native: All Persons having origins in any of the original peoples of North America and who maintain cultural identification through tribal affiliations or community recognition.

Asian or Pacific Islanders: All Persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent or the Pacific Islands. The area includes, for example, China, Japan, Korea, the Philippine Islands and Samoa.

Black: (Not of the Hispanic Origin) All Persons having origin in any of the black racial groups of Africa.

Hispanic: All Persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish culture or origin, regardless of race.

White: (Not of the Hispanic Origin) All Persons having origins in any of the original peoples of Europe, North Africa or the Middle East.

6. HOW DID YOU LEARN OF THE PROJECT FOR WHICH YOU ARE SUBMITTING A BID?

a. _____ Walk-in
b. _____ Newspaper Advertisement
c. _____ Cable Television Announcement
d. _____ Posted Announcement
e. _____ Other – Explain:

_____

_____

_____

_____

SCHEDULE A: INFORMATION FOR DETERMINING JOINT VENTURE ELIGIBILITY

(This form needs to be filled in if all Joint Venture forms are minority owed).

1. Name of Joint Venture: _____

2. Address of Joint Venture: _____

3. Phone No. of Joint Venture: _____

4. Identify the firms which comprise the Joint Venture (the DBE Partner must be State certified or certified by Frederick County).

   _____

   _____

   _____

   A. Describe the role of the DBE firm in the Joint Venture:

   _____

   _____

   _____

   B. Describe very briefly the experience and business qualifications of each non- DBE Joint Venture:

   _____

   _____

   _____

5. Nature of the Joint Venture's Business: _____

6. Provide a copy of the Joint Venture Agreement

7. What is the claimed percentage of DBE ownership?: _____

8. Ownership of Joint Venture: (This need not be filled in if described in the Joint Venture Agreement, provided by Question 6):

   A. Profit and loss sharing
   B. Capital contributions, including equipment
   C. Other applicable ownership interests

   _____

   _____

9. Control of and participation in this contract. Identify by name, race, sex, and firm those individuals (and their titles) who are responsible for day-to-day management and policy decision-making, including, but not limited to, those with prime responsibility for:

A. Final Decisions _____

B. Management Decisions, such as:

1. Estimating _____
2. Marketing and Sales _____
3. Hiring and firing of Management Personnel _____

_____

4. Purchases of Major Items or Supplies _____

_____

C. Supervision of Field Operations _____

_____

Note: If, after filing this Schedule A and before the completion of the Joint Venture's work on the contract covered by this regulation, there is any significant change in the information submitted, the Joint Venture must inform the Grantee, either directly or through the prime contractor if the Joint Venture is a subcontractor.

SCHEDULE A: INFORMATION FOR DETERMINING JOINT VENTURE ELIGIBILITY

AFFIDAVIT

"The undersigned swear that the foregoing statements are correct and include all material information necessary to identify and explain the terms and operation of our joint venture and the intended participation by each joint venture in the undertaking. Further, the undersigned covenant and agree to provide to the grantee current, complete and accurate information regarding actual joint venture work on the payment therefore and any proposed changes in any of the joint adventure arrangements and to permit the audit and examination of the books, records and files of the joint venture, or those of joint venture relevant to the joint venture, by authorized representatives of the grantee or the federal funding agency. Any material misrepresentation will be grounds for terminating any contract which may be awarded and for initialing action under federal or state laws concerning false statements."

Name of Firm	Name of Firm
Signature	Signature
Name	Name
Title	Title
Date	Date

SCHEDULE A: INFORMATION FOR DETERMINING JOINT VENTURE ELIGIBILITY

State of _____, County of _____

On this _____ day of _____, 20_____, before me appeared known, who, being duly sworn, did execute the foregoing affidavit, and did state that he or she was properly authorized by _____
(Name of Firm)
to execute the affidavit and did so as his or her free act and deed.

Seal _____
Notary Public

My Commission Expires: _____

State of _____, County of _____

On this _____ day of _____, 20_____, before me appeared known, who, being duly sworn, did execute the foregoing affidavit, and did state that he or she was properly authorized by _____
(Name of Firm)
to execute the affidavit and did so as his or her free act and deed.

Seal _____
Notary Public

My Commission Expires: _____

FREDERICK COUNTY PROJECT NO. ***SW0745***
LANDFILL STORMWATER
PUMP STATIONS IMPROVEMENTS

PROPOSAL

OWNER: Board of County Commissioners of Frederick County, Maryland

PROPOSAL ON PROJECT NO. ***SW0745***

Made this _____ day of _____ 20_____.

By: _____

_____
Business Address

The Bidder declares that the only person, firm or corporation or persons, firms or corporations, that has or have any interest in this Proposal, or in the contract or contracts proposed to be taken, is or are the undersigned, that this Proposal is made without any connection or collusion with any person, firm or corporation making a Proposal for the same work, that the attached information for Bidder, Special Provisions and Form of Contract, and the General and Technical specifications, Standard Details and Drawings therein referred to, have been carefully examined and are understood, that as careful an examination has been made as is necessary to become informed as to the character and extent of the work to contract with the Owner in the Form of Contract hereto attached, to do the required work in the manner set forth in the Special Provisions, General and Technical Specifications, Standard Details and as shown by the Drawings.

The unit prices on the attached and signed Proposal Forms are to be included and cover the furnishings of all materials and labor requisite and proper and the providing of all necessary machinery, tools, apparatus and means for performing the work and the doing of all the above mentioned work, in the manner set forth, described and shown in the Special Provisions, General and Technical Specifications, Standard Details and on the Contract Drawings, within the prescribed time. If this Proposal shall be accepted by the Owner and the undersigned shall refuse or neglect, within 10 days after receiving the Contract for said Owner may at its option, determine that the Bidder has abandoned the Contract, and thereupon the Proposal and the acceptance thereof shall be forfeited to and become the property of said Owner.

Note: The Bidder of Bidders must sign here, and the address for each must be given. In the case of firms, the firm's name must be signed and subscribed to by at least one member. In the case of corporation, the corporate name must be signed by some authorized officer or agent thereof, who shall also subscribe his name and office. If practicable, the seal of the corporation shall be affixed.

Enclosed herewith find cashier's or treasurer's check or bid bond in the amount of _____ Dollars ($_____) made payable to the "County Commissioners, Frederick County, Maryland." This certified cashiers or treasurer's check or Bid Bond is a Proposal Guarantee (which is understood will be forfeited in the event the Form of Contract is not executed, if awarded to the undersigned), and is based on the aggregate amount of the bid submitted.

(for Execution by Individuals, Partnerships or Corporations)

FOR INDIVIDUALS AND PARTNERSHIPS:

_____ (SEAL)

WITNESS: BY: _____ (SEAL)

_____ _____ (SEAL)

FOR CORPORATIONS:

_____ (SEAL)

NAME:_____(SEAL)

BY: _____ (SEAL)
PRESIDENT

ATTEST:

_____
SECRETARY

The Proposal Form shall be filled out in ink. The Proposal, if submitted by an individual, shall be signed by an individual, if submitted by a partnership, shall be signed by such member or members of the partnership as have authority to bind the partnership; if submitted by a corporation the name shall be signed by an officer and attested by the Secretary or an Assistant Secretary. If not signed by an officer, as aforesaid, there must be attached a copy of that portion of the By-laws, or a copy of a Board Resolution, duly certified by the Secretary, showing the authority of the person so signing on behalf of the corporation.

In lieu thereof, the corporation may file such evidence with the Board of County Commissioners of Frederick County, duly certified by the Secretary, together with a list of the names of those officers having authority to execute documents on behalf of the corporation, duly certified by the Secretary, which listing shall remain in full force and effect until such time as the Board of County Commissioners of Frederick County is advised in writing to the contrary. In any case where a Proposal is signed by an Attorney-in-fact must be accompanied by a copy of the appointing document, duly certified.

The name and addresses of all members of a firm or the names, addresses and titles of every officer of a corporation, as the case may be, must be given here by the member of the firm, or by the officer of agent of the corporation who signs the Proposal.

_____
_____
_____
_____
_____

Bidder hereby agrees to commence work under this Contract within ten (10) days after service of a written "Notice to Proceed" from the Owner and to complete the work fully within 210 calendar days after date of said service.

Bidder acknowledges receipt of the following Addenda:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

Having carefully examined the Specifications and Special Provisions for the work hereinbefore named, and in conformity with the Specifications, I/We certify that I/we am/are the only person or persons interested in this proposal as principals; that is, made without collusion with any person, firm or corporation; that an examination has been made of the Specifications and the Contract Documents, including the Special Provisions contained herein, and of the site of the work, and propose to furnish all necessary machinery, plant, equipment, tools, labor and other means of construction, and furnish all materials specified, in the manner and at the times prescribed, and perform all work as follows:

FREDERICK COUNTY PROJECT NO. ***SW0745***
LANDFILL STORMWATER PUMP STATION IMPROVEMENTS

PROPOSAL FORM – BASE BID

Date: _____

Bidder: _____

Bidder Address: _____

_____

Phone: _____

Signature: _____

Bid Schedule Base Bid

Item No.	Quantity	Units	Description	Unit Price	Total Price
1	1	LS	Furnish and install complete electrical control and power system at the East Boyer Run Site as shown in the contract drawings and described in the specifications	$	$
2	3	EA	Furnish and install new high flow pump and associated piping at the East Boyer Run Site as shown in the contract drawings and specifications	$	$
3	1	LS	Miscellaneous site work at the East Boyer Run Site as shown on the contract drawings and specifications.	$	$
4	1	LS	Furnish and install pavilion structure at the East Boyer Run Site as shown in the contract drawings and specifications	$	$
5	1	LS	Furnish and install complete electrical control and power system at the West Boyer Run Site as shown in the contract drawings and described in the specifications	$	$
6	1	LS	Miscellaneous site work at the East Boyer Run Site as shown on the contract drawings and specifications.	$	$

Item No.	Quantity	Units	Description	Unit Price	Total Price
7	2	EA	Furnish and install new low flow pump and associated piping at the West Boyer Run Site as shown in the contract drawings and specifications	$	$
8	1	LS	Furnish and install pavilion structure at the West Boyer Run Site as shown in the contract drawings and specifications	$	$
9	1	LS	Record Drawings	$5,000	$5,000
Total for Base Bid Items:				$	

Total for Bid Schedule Base Bid Items in writing $_____

_____

We shall complete the work within 210 calendar days following the notice to proceed.

IT IS THE INTENT OF THE COUNTY TO ASSESS LIQUIDATED DAMAGES IN ACCORDANCE WITH ARTICLE 15 OF THE GENERAL CONDITIONS AND AS MODIFIED IN THE SPECIAL PROVISIONS OF THIS DOCUMENT FOR EACH CALENDAR DAY THE CONTRACTOR IS DELINQUENT IN COMPLETING THE WORK IN THE CONTRACT.

Refer to the Measurement and Payment section of the special provisions section of these contract documents for general description of the Base Bid and Contingent Bid Items.

LISTING OF SUBCONTRACTORS

Bidder_____

This document is an Attachment to the Bid and is a legally binding part thereof;

Each Bidder shall complete this "Listing of Subcontractors" in its entirety. Failure to do so may render the Bid Form non-responsive and be grounds for its rejection by Owner. Subcontracting shall comply with Frederick County General Conditions Article 28.

The address of the subcontractor does not need to be completed at the time the bids are due, but may be delivered within 72 hours of the opening date and time. All other information pertaining to this document shall be provided in the bid envelope with the bid documents.

Type of Work	Subcontractor Name & Address	Subcontract Amount
	Total Subcontracted Amount:	**$**
	Percent of Total Contract:	

FREDERICK COUNTY PROJECT NO. ***SW0745***
LANDFILL STORMWATER PUMP STATIONS IMPROVEMENTS

BIDDER CERTIFICATION OF WORK CAPACITY

This certifies that the undersigned guarantees all of the work performed under this Contract to be done in accordance with the Specifications and Special Provisions in a good workmanlike manner and to renew or repair any work which may be rejected due to defective workmanship or materials, prior to final completion and acceptance of the work. Also, we have the equipment, labor supervision, and financial capacity to perform this Contract either with our organization or with subcontractors.

_____
BIDDER

BY: _____
SIGNATURE/TITLE

Sworn to before me this _____ day of _____, 20_____.

My commission expires _____.

_____
NOTARY PUBLIC

FREDERICK COUNTY PROJECT NO. ***SW0745***
LANDFILL STORMWATER PUMP STATIONS IMPROVEMENTS

AFFIDAVIT OF QUALIFICATION TO BID

I hereby affirm that:

1. I am the _____ and duly authorized representative
TITLE

Of the Firm _____
NAME OF CORPORATION

Of whose address is _____
And that I possess the legal authority to make this Affidavit on behalf of myself and the Firm for which I am acting.

2. Except as described in Paragraph 3 below, neither I nor the above Firm, nor to the best of my knowledge, any of its officers, directors, or partners, or any of its employees directly involved in obtaining Contracts with the State, any unit of the State, or any local governmental entity in the State (including a county, bi-county, or multi-county governmental entity) have been convicted of, or have pleaded nolo contendere to a charge of, having during the course of an official investigation or other proceeding admitted, in writing or under oath, acts or omissions which constitute bribery, attempted bribery, or conspiracy to bribe under the provisions of Article 27 of the Annotated Code of Maryland or under the laws of any State or the Federal Government. (Conduct prior to July 1, 1977 is not required to be reported).

3. _____
_____

(State "None" or, as appropriate, list any conviction, plea, or admission described in Paragraph 2 above, with the date; court, official or administrative body, the individuals involved and their position with the firm; and the sentence of disposition, if any).

I acknowledge that this Affidavit is to be furnished to Frederick County and where appropriate to the Board of Public Works and the Attorney General under Maryland State Finance and Procurement Code Annotated, Sections 16-2001 through 16-208. I acknowledge that if the representations set forth in this Affidavit are not true and correct, the Board of County Commissioners of Frederick County may terminate any Contract awarded and take any other appropriate action. I further acknowledge that I am executing this Affidavit in compliance with Maryland State Finance and Procurement Code Annotated, Sections 16-201 through 16-208, which provides that certain persons who have been convicted or have admitted to bribery, attempted bribery, or conspiracy to bribe, may be disqualified, either by operation of law or after a hearing, from entering into Contracts with the State or any of its agencies or subdivision.

I do solemnly declare and affirm under the penalties of perjury and upon personal knowledge that the contents of the Affidavit are true and correct.

DATE: _____ NAME: _____

CERTIFICATION OF COMPLIANCE

With Frederick County Purchasing Regulation 1-2-36, Hiring of Illegal Aliens Prohibited for Performance of County Work

I,_____, hereby certify or attest that:
(Name)

1. I am the owner or authorized representative of _____;
(Name of Firm)

2. In compliance with Frederick County Purchasing Regulation 1-2-36, and as a contractual requirement of doing business with Frederick County Government, my firm and all of my firm's subcontractors shall only employ individuals legally authorized to work within the United States of America and within Frederick County, Maryland in the performance of work under this contract.;

3. Compliance with Frederick County Purchasing Regulation 1-2-36 is a material contractual obligation and that breach of this obligation could result in contract termination in addition to, and not in lieu of, any and all other remedies available to Frederick County Government and any and all other damages for which my firm might be liable; and

4. Nothing within Frederick County Purchasing Regulation requires Frederick County Government to elect to terminate a contract for default to the exclusion of any other remedy.

By my signature below, I swear or affirm under penalties of perjury that the contents of this Certification of Compliance are true to the best of my knowledge, information and belief.

_____ _____
(Signature) (Date)

Print Name of Signatory: _____

Print Title of Signatory: _____

Employer Name: _____

Employer Address: _____

_____

FREDERICK COUNTY PROJECT NO. ***SW0745***
LANDFILL STORMWATER PUMP STATION IMPROVEMENTS

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned, _____ _____ as Principal and _____ _____ as Surety are hereby held and firmly bound unto the Board of County Commissioners of Frederick, County, Maryland as Owner in the full and just sum of _____ Dollars ($_____) for the payment of which, well and truly be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns. Signed this _____ day of _____ _____, 20___.

The conditions of the above obligation is such that whereas the Principal has submitted the Owner a certain Bid, attached hereto and hereby made a part hereof, to enter into a contract in writing for the construction complete of Project Number ***SW0745***.

NOW, THEREFORE,

(a) If said Bid shall be rejected, or in the alternate,
(b) If said Bid shall be accepted and the Principal shall execute and deliver a Contract Agreement in the form attached hereto, properly completed in accordance with said Bid and shall furnish a bond for his faithful performance of the Contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said Bid.

then this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its bond shall be in no way impaired or affected by an extension of the time within which the Owner may accept such Bid; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

INDIVIDUAL PRINCIPAL

Business Name: _____

Address: _____

In presence of Witness: _____

_____As to _____

PRINCIPAL

CO-PARTNERSHIP PRINCIPAL

Co-partnership Name: _____

Address: _____

In presence of Witness: _____

_____As to _____

PRINCIPAL

_____As to _____

PRINCIPAL

_____As to _____

PRINCIPAL

CORPORATE PRINCIPAL

Corporation Name: _____

Attest: Address: _____

_____

_____ By: _____

TREASURER

_____Title: _____

SECRETARY (affix Corporate Seal)

SURETY

Surety Name: _____

Address: _____

_____

By: _____

Title: _____

(affix Corporate Seal)

FREDERICK COUNTY PROJECT NO. ***SW0745***
BOARD OF COUNTY COMMISSIONERS
DIVISION OF UTILITIES AND SOLID WASTE MANAGEMENT

CONTRACT

THIS CONTRACT, made this ___day of_____, by and between _____, hereinafter called the "CONTRACTOR", and the BOARD OF COUNTY COMMISSIONERS OF FREDERICK COUNTY, MARYLAND, hereinafter called the "OWNER".

WITNESSETH, that the Contractor and the Owner for the consideration stated herein agree as follow:

Article 1. Scope of Work. The Contractor shall perform everything required to be performed and shall provide and furnish all the labor, materials, necessary tools, expendable equipment, and all utility and transportation services required to perform and complete in a workmanlike manner all the work required for the construction of the Board of County Commissioners of Frederick County, Maryland, Division of Utilities and Solid Waste Management Contract designated ***Landfill Stormwater Pump Stations Improvements, Project No. SW0745***, all in strict accordance with the Contract Drawings and Specifications including any and all Addenda, prepared by Frederick County, which Contract Drawings and Specifications are made a part of the Contract and in strict compliance with the Contractor's Proposal and the other sections of the Contract documents herein mentioned which are a part of this Contract, and the Contractor shall do everything required by this Contract and the other documents constituting a part hereof.

Article II. The Contract Price. The Owner shall pay to the Contractor for the actual quantities supplied and installed in the performance of this Contract, subject to any additions or deductions provided therein, in current funds, an amount not to exceed the contract bid price of _____.

The foregoing bid price shall be the basis for establishing the amount of the Performance and Payment Bonds, and is not to be construed to be a lump sum contract price. The quantities of the unit price items as stated in the Contractor's Proposal are approximate only, and it is understood and agreed that payment will be made only on the actual quantities of work completed in place measured on the basis defined in the Contract Conditions and Contract Specifications and at the unit prices stated.

Article III. Component Parts of this Contract. This contract consists of the following component parts, all of which are as fully a part of this Contract as if herein set out verbatim or, if not attached, as if hereto attached:

1. Addenda No. _____, _____, _____, _____, _____, and _____.
2. General Conditions and Standard Specifications dated October 1983.
3. Contract Drawings.
4. Standard Details revised and approved December 13, 1993.
5. Special Provisions dated October 1991 (Amended July 20, 2006).
6. Project Specifications.
7. Special Provisions of the Contract
8. Information to Bidders.
9. Invitation to Bid.
10. Contractor's Proposal.
11. This Instrument.
12. Contractor's Performance and Payment Bonds and Insurance Policies.

This Contract is intended to conform in all respects to applicable statutes of the State or County in which the work is to be constructed, and if any part or provision of this Contract conflicts therewith, said statute shall govern.

Article IV. Starting and Completion. The Contractor agrees to commence work under this Contract on a date to be specified in a written order from the Owner, and to fully complete all work included in the Contract to the point of conditional acceptance by the Owner within 210 consecutive calendar days including the said date, and the liquidated damage provisions of this Contract, $1,000.00 per calendar day, applies to this time period.

ATTEST:

_____
(Contractor)

_____ By:_____

Title:_____ Title:_____

Date:_____

BOARD OF COUNTY COMMISSIONERS
OF FREDERICK COUNTY, MARYLAND

ATTEST: OWNER:

_____ BY:_____

Lori L. Depies
County Manager

Blaine R. Young
President

FREDERICK COUNTY PROJECT NO. ***SW0745***
LANDFILL STORMWATER PUMP STATION IMPROVEMENTS

LABOR AND MATERIAL PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS, that we,_____

_____ as Principal, and, _____

_____ as Surety, are held and firmly bound unto the Frederick County Board of County Commissioners as Owner in the full and just sum of _____Dollars ($_____) lawful money of the United States of America, to be paid to said Frederick County Board of County Commissioners or to their attorney, to which payment well and truly to be made and done, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly these presents.

WHEREAS, the above bounden _____ (Contractor) (hereinafter called the Contractor) has entered or is about to enter into a Contract with the said Frederick County Board of County Commissioners bearing even day herewith, among other things for the furnishing of all labor and material necessary for the construction of the ***Landfill Stormwater Pump Stations Improvements***, Frederick County Project No. ***SW0745*** (hereinafter called the Contract) in Frederick County, Maryland and which Contract and all documents forming a part thereof shall be deemed a part hereof as fully as if set herein, and

WHEREAS, it was one of the conditions of the award of said Contract, and pursuant to which said Contract was entered into, that these presents should be executed.

NOW, THEREFORE, THE CONDITIONS OF THE OBLIGATION ARE SUCH, that if the said Principal and all sub-contractors to whom any portion of the work provided for in said Contract is sublet and all assignees of said Principal and of such sub-contractors shall promptly make payment for all materials furnished and/or all labor performed and services rendered in the

prosecution and/or construction of the work provided for in said Contract or in any amendment or extension of or addition to said contract which may be made with or without notice to the Surety, then the above obligation shall be void; otherwise to remain in full force and effect,

PROVIDED, however that this Bond is subject to the following conditions and limitations.

(a) All persons, firms, and/or corporations who have furnished materials and/or performed labor or rendered services as aforesaid shall have a direct right of action against the principal and Surety on this Bond, which right of action shall be asserted in proceedings instituted in any court of appropriate jurisdiction. Insofar as permitted by laws of the forum, such right of action shall be asserted in a proceeding instituted in the name of the Frederick County Board of County Commissioners to the use and benefit of the person instituting such action and of all other persons have claims hereunder, and any other person having a claim hereunder shall have the right to be made a party to such proceedings, (but not later than six months after the complete performance of said Contract and final settlement thereof) and to have such claim adjudicated in such action and judgment rendered thereon.

(b) The Surety shall not be liable hereunder for any damages or compensation recoverable under any workman's compensation or employer's liability statute.

(c) In no event shall the Surety be liable for a greater sum than the penalty of this Bond, or subject to any suit, action or proceeding thereon that is instituted later than six months after the complete performance of said Contract and final settlement thereof.

IN WITNESS WHEREOF, the said _____ has caused
(Contractor)

this bond to be signed in its name, by its President and its corporate seal to be hereon affixed,

duly attested by its Secretary and the said _____ has caused
(Surety)

this bond to be signed in its name by its _____and its corporate seal to be hereon affixed, duly attested by its _____ this _____day of _____ _____ in the year _____.

WITNESS: _____(SEAL)
(Contractor)

_____ By: _____(SEAL)
(President)

_____ ATTEST: _____ (SEAL)
(Secretary)

WITNESS:

_____(SEAL)
(Surety)

_____ By: _____(SEAL)
(President)

_____ ATTEST: _____ (SEAL)
(Secretary)

FREDERICK COUNTY PROJECT NO. ***SW0745***
LANDFILL STORMWATER PUMP STATION IMPROVEMENTS

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS, that we,_____

_____ as Principal, and, _____

_____ as Surety, are held and firmly bound unto the Frederick County Board of County Commissioners as Owner in the full and just sum of _____Dollars ($_____) lawful money of the United States of America, to be paid to said Frederick County Board of County Commissioners or to their attorney, to which payment well and truly to be made and done, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the above bounden _____ (Contractor) (hereinafter called the Contractor) has entered or is about to enter into a Contract with the said Frederick County Board of County Commissioners bearing even day herewith, among other things for the furnishing of all labor and material necessary for the construction of the Landfill Stormwater Pump Stations Improvements, Frederick County Project No. ***SW0745*** (hereinafter called the Contract) in Frederick County, Maryland and which Contract and all documents forming a part thereof shall be deemed a part hereof as fully as if set herein, and

WHEREAS, it was one of the conditions of the award of said Contract, and pursuant to which said Contract was entered into, that these presents should be executed.

NOW, THEREFORE, THE CONDITIONS OF THE OBLIGATION ARE SUCH, that if the said Contractor shall well and truly perform, fulfill and comply in all respects with all the undertakings, covenants, terms, and conditions and agreements of the said Contract, and, all obligations thereunder, including the proposal, specifications and/or drawings, etc., therein referred to, and made a part thereof, during the original term of said Contract, and any extension or extensions thereof, that may be granted from time to time, by said Board of County Commissioners with or without notice to the surety, and during the term or terms of any guarantee required under the proposal, specifications and/or drawings, etc. and shall also well and truly perform, fulfill and comply in all respects with all the undertakings, covenants, terms, and conditions and agreements of any and all duly authorized modifications of said Contract that may be made hereafter, with or without notice to the surety, and shall indemnify and save harmless said Frederick County Board of County Commissioners, its agents and employees against and from all cost, expenses, damages, injury or loss to which the said Board of County Commissioners, its agents and employees may be subjected by reason of any wrongdoing, misconduct, want of care of skill, negligence or default upon the part of the said Contractor, their agents or employees, or in any other manner arising, directly or indirectly from any and all causes whatsoever, in or about the execution of performance of the Contract, including said Board of County Commissioners, their agents and employees against and from all losses to it from any cause whatsoever, including actual or alleged patent infringements in furnishing, delivery and constructing complete the said Contract, then this obligation to be void, otherwise to be remain in full force and virtue in law.

IN WITNESS WHEREOF, the said _____ has caused
(Contractor)

this bond to be signed in its name, by its President and its corporate seal to be hereon affixed, duly attested by its Secretary and the said _____ has caused
(Surety)

this bond to be signed in its name by its _____and its corporate seal to be hereon affixed, duly attested by its _____ this _____day of _____ _____ in the year _____.

WITNESS: _____(SEAL)
(Contractor)

_____ By: _____(SEAL)
(President)

_____ ATTEST: _____ (SEAL)
(Secretary)

WITNESS:

_____(SEAL)
(Surety)

_____ By: _____(SEAL)
(President)

_____ ATTEST: _____ (SEAL)
(Secretary)

SPECIAL PROVISIONS

TO PROJECT NO. ***SW0745***

1. SCOPE

   The Special Provisions detailed below are meant to augment and/or amend the "General Conditions and Standard Specifications for Water Mains, Sanitary Sewers and Related Structures," Frederick County Department of Public Works, Frederick, Maryland, revised and approved December 13, 1983, Special Provisions dated July 2006, "Standard Details for Water Mains, Sanitary Sewers and Related Structures", Frederick County Department of Public Works, Frederick, Maryland, revised and approved December 13, 1993, and any additions or revisions thereto.

   n case of conflict between the STANDARD SPECIFICATIONS or STANDARD DETAILS and this contract specification, this contract specification shall govern.

2. DIFFERING SITE CONDITIONS

   It is expressly understood and agreed that the Owner assumes no responsibility whatsoever in respect to the sufficiency or of the interpretations set forth therein. There is no guarantee, either expressed or implied, that the site conditions indicated or described are representative of those conditions existing throughout such areas, or any part thereof, or that unlooked for developments may not occur, or that materials other than, or in proportions different from those indicated, may not be encountered.

3. OWNER'S INTENT

   Contractor agrees that the description of the work to be performed is sufficient and understands that the work must be completed in its entirety so that it is fully ready to perform its intended function and produce its intended results. Contractor agrees that everything necessary to accomplish this is included in the contract, unless explicitly excluded on the contract documents.

4. GENERAL NOTES

   ~~A. All elevations refer to datum shown with bench marks.~~

   B. Existing utilities are shown from the best available information. The Contractor shall field verify all utility locations and elevations to his own satisfaction prior to any construction at no additional cost. The Contractor shall take all necessary precautions to protect and maintain services.

   C. Trade Permits: Contractor shall be responsible for providing trade permits for all work associated with this contract.

5. MEASUREMENT AND PAYMENT

   A. General

      a. Each unit or lump sum price stated on the BID FORM shall constitute full compensation as herein specified for each item of work completed in accordance with the drawings and specifications.

b. Under the price specified to be paid for each item, the Contractor shall furnish all materials and equipment, furnish all labor and parts, and do all operations necessary to complete all work specified or shown. All supervision, overhead items, protection and precautions and all other costs incidental to the construction work completed and as specified are included.

c. A complete, finished, working job, as intended by the general nature of these specifications, shall be produced whether or not any particular wording or direction is omitted or inadvertently not clearly stated.

d. Measurement for payment shall be by the OWNER, except where noted elsewhere in this specification. Measurement for payment for lump sum items shall be on the basis of percentage of work complete and in place.

e. The prices for those items which involve excavation shall include compensation for disposal of surplus excavated material and handling water.

f. The prices for all pipe items shall constitute full compensation for furnishing, laying, jointing, and testing of pipe; excavation and backfill; clean up.

B. Base Bid Items

a. Base Bid Item No. 1

For the lump sum price, the Contractor shall furnish all materials, equipment, labor, and perform all operations necessary to complete all work specified or shown associated with the construction of the new electrical control and power systems at the East Boyer Run site including, but not limited to, all wire and conduit, new electrical enclosures, new Motor Control Center, new controllers, new equipment pad, and motor starters. Bid item shall also include all demolition called and necessary to take the existing system offline.

b. Base Bid Item No. 2

For each bid item price, the Contractor shall furnish all materials, equipment, labor, and perform all operations necessary to complete all work specified or shown associated with the installation of a dry pit submersible pump at the East Boyer Run site, including, but not limited to, the pump, pump frame, pump motor, mechanical seals, pipe fittings and modifications necessary to connect proposed pump to existing pipe, and any pump frame modifications necessary to incorporate pump into existing pipe arrangement.

c. Base Bid Item No. 3

For the lump sum price, the Contractor shall furnish all materials, equipment, labor, and perform all operations necessary to complete all work specified or shown associated with, but not limited to, the rerouting of the existing dry well sump pump pipe to an onsite wet well, installation of a stone apron around the proposed pavilion, and general site work and restoration necessary for a complete job. All of these items are at the East Boyer Run site.

d. Base Bid Item No. 4

For the lump sum price, the Contractor shall furnish all material, equipment, labor, and perform all operations necessary to complete all work specified or shown associated with the installation of the pavilion at the East Boyer Run site

as shown on the documents including, but not limited to the pavilion and associated footers.

e. Base Bid Item No. 5

For the lump sum price, the Contractor shall furnish all materials, equipment, labor, and perform all operations necessary to complete all work specified or shown associated with the construction of the new electrical control and power systems at the West Boyer Run site including, but not limited to, all wire and conduit, new electrical enclosures, new Motor Control Center, new controllers, new equipment pad, and motor starters. Bid item shall also include all demolition called and necessary to take the existing system offline.

f. Base Bid Item No. 6

For the lump sum price, the Contractor shall furnish all materials, equipment, labor, and perform all operations necessary to complete all work specified or shown associated with, but not limited to, installation of a stone apron around the proposed pavilion, and general site work and restoration necessary for a complete job. All of these items are at the East Boyer Run site.

g. Base Bid Item No. 7

For each bid item price, the Contractor shall furnish all materials, equipment, labor, and perform all operations necessary to complete all work specified or shown associated with the installation of a dry pit submersible pump at the West Boyer Run site, including, but not limited to, the pump, pump frame, pump motor, mechanical seals, pipe fittings and modifications necessary to connect proposed pump to existing pipe, and any pump frame modifications necessary to incorporate pump into existing pipe arrangement.

h. Base Bid Item No. 8

For the lump sum price, the Contractor shall furnish all material, equipment, labor, and perform all operations necessary to complete all work specified or shown associated with the installation of the pavilion at the West Boyer Run site as shown on the documents including, but not limited to the pavilion and associated footers.

i. Base Bid Item No. 9

For the lump sum price, the Contractor shall furnish red-line record drawings to the County. The drawings shall record all variances made from the construction drawings, as required by the Contract Documents.

6. EXISTING UTILITIES

The Contractor's attention is directed to Standard Specifications Section 01010 -SITE CONDITIONS. The existence of utilities other than shown on the Contract Drawings is unknown.

The location of known existing utilities based County utility records are shown on the Contract Drawings. The Contractor shall locate, by test pit, at no additional expense to the owner, all utilities before excavating in the area where they are shown. The Contractor shall take all necessary precautions to protect and maintain existing utility customer services. Test pitting of all utilities that are identified on the Contract Drawings shall not be measured and paid for

separately. The cost of test pits shall be included in the bid prices for the various bid items included in the Contract.

The Contractor shall call "MISS UTILITY" 1-800-257-7777 seventy-two (72) hours prior to the start of the work.

Should the Contractor in the course of his operations encounter any underground utilities, the presence of which was not previously known, he shall immediately notify the Engineer, and take all necessary precautions to protect the utilities and maintain continuance of service until said utilities can be relocated by their Owners, if necessary.

Should any existing utilities be damaged due to the operations of the Contractor, the Owner shall be immediately notified and the Contractor shall repair or replace the damaged or destroyed components, as necessary to restore the utility to satisfactory operating condition, entirely at the Contractor's expense.

No measurement or direct payment will be made to the Contractor for working around or protecting the utilities within the Contract limits. This includes the work interruptions, special scheduling, staged construction or any effort required by the presence of utilities. It is a requirement that the Contractor cooperate with the Owners of the utilities and/or other Contractors. All costs incurred shall be included and considered incidental to the pay items set up in the proposal.

7. PERMITS

The Owner has applied for the following permits or approvals on the project:

- County Building Permit

As of the date of Contract Award, any permits not yet received will be issued to the successful bidder prior to the start of work. The Notice to Proceed will not be issued until the County has received all permits for this Contract. The terms and conditions set forth in the permits necessary for execution of this Contract are hereby made a part of this Contract. All costs to comply with permit requirements or to correct, maintain, reinstall, repair, etc. violations of the permits are the responsibility of the Contractor and shall be done at no cost to the County. Copies of these permits are to be kept on the site and posted at all times. Copies of the applicable permits are included herein in the Appendix.

8. SEDIMENT AND EROSION CONTROL

The Contractor shall be responsible for providing temporary erosion and sediment control measures throughout the life of this Contract in accordance with the "1994 Maryland Standards and Specifications for Soil Erosion and Sediment Control, "County Specifications, these Contract Provisions and Supplemental Specifications, the Contract Plans, and as directed by the Engineer.

9. MARYLAND DEPARTMENT OF LABOR AND INDUSTRY -SAFETY REQUIREMENTS GENERAL ORDER- CONSTRUCTION

Under provisions contained in the Maryland Occupational Safety Law, Article 89, Sections 28-48, Annotated Code of Maryland, 1957b Edition, the employer shall furnish and maintain

employment and a place of employment which shall be reasonably safe for employees. To this end, the Department of Labor and Industry has adopted the American standard Safety Code for Building Construction, AI0.2-1944 which contains minimum standards having a full force and effect of law, and provides for criminal penalties, fines and imprisonment for failure to comply. These standards must be observed and maintained throughout the entire construction project. This General Order shall remain effective as construction progresses and until such time as this project is completed.

10. INSTALLATION OF PUMP EQUIPMENT, POWER/CONTROL SYSTEMS, AND PAVILIONS– (Sequence of Construction)

Construction of the Landfill Pump Stations Improvements, including but not limited to; new control/power systems, new pumps, mechanical piping, new pavilions, and minor site work shall proceed in the recommended order outlined below. During construction, the Contractor shall take any and all measures necessary to maintain the integrity of the existing water, sewer, and electrical facilities. Such utilities shall remain in continuous operation during construction, unless specified below. Reparations of any and all damage to the water and sewer facilities incurred during construction shall be the responsibility of the Contractor.

Any proposed deviation from the following sequence of construction shall be approved in writing by both the Engineer and the Owner. Written approval is not intended as a deterrent to alternative approaches, but as a requirement to ensure communication between the Owner, Contractor and Engineer.

10.1 A pre-construction meeting, as well as site meetings, shall be held with necessary permitting bodies before any activity on the site shall begin.

10.2 Submit equipment and materials to Engineer/Owner for approval.

10.3 Install the new control/power system and install new pumps at each site. It is preferred by the Owner that the Contractor have the East Boyer Run site complete first due to the current condition of that existing station. At the Contractor's discretion, the pavilions and site work can be done simultaneous to the items described in 10.4 and 10.5.

10.4 Energize the new control/power system. Connect new and existing equipment (pumps, pressure transducers, etc.) to the new power/control system. Contractor shall perform the transfer of equipment from the existing source to the new source during a dry weather period to reduce the potential need of the pump station during the transfer process.

10.4.1 During the transfer of power at the West Boyer Run site, the Contractor shall be limited to making that transfer after 4:30 PM to avoid conflict with operation of equipment at the recycle center that is powered by the power system at the West Boyer Run site.

10.5 Contractor shall test the new pumps, control and power systems for proper operation including: proper sequence of operation of pumps, proper alternating of pumps, proper response to failure of primary power, proper sequence of operation after return to primary power from emergency power, and all alarms.

10.6 Contractor shall construct pavilions and perform minor site work, if not completed during 10.4 and 10.5.

10.7 The contractor shall have all pump installations certified by the authorized equipment manufacturer representative.

10.8 Once tests signify all equipment is in proper working order, the demolishing of old equipment may begin.

10.9 Project clean up, restoration, and restablization shall proceed in accordance with section 01900. Contractor shall turn over record drawings to the Owner.

10.10 Contractor shall coordinate a final walkthrough for substantial completion.

10.11 Contractor shall address all items identified in the substantial completion walkthrough.

All items under this sequence shall be completed within the contract time.

SPECIAL PROVISIONS

Article 14: *Changes In Contract Price and Time*

All work shall be in accordance with Standard Specification Article 14: CHANGES IN CONTRACT PRICE AND TIME, except as modified herein.

Add an Additional Paragraph as follows:

1. "14.3 Unusually severe weather must be more severe than the inclement weather anticipated for the project location during any given month. The following schedule of monthly anticipated inclement weather delays will constitute the baseline for monthly weather time evaluation. The Contractor's progress schedule must reflect these anticipated inclement weather delays in all weather dependent activities.

Anticipated monthly inclement weather days are as follows:

January	7	July	6
February	7	August	6
March	8	September	6
April	8	October	5
May	8	November	6
June	6	December	6

Article 15: *Time for Completion and Liquidated Damages*

All work shall be in accordance with Standard Specification Article 15: TIME FOR COMPLETION AND LIQIDATED DAMAGES, except as modified herein.

In paragraph 15.3 replace "the amount of liquidated damages as specified below" with "$1,000.00".

Delete subparagraph 15.3.a in its entirety.

Article 21: *Payments to the Contractor*

All work shall be in accordance with Standard Specification Article 21: PAYMENTS TO THE CONTACTOR, except as modified herein.

In paragraph 21.1 insert the following sentences at the end of the paragraph "The Engineer may, however, at any time after fifty percent (50%) of the work has been completed, make part or all the remaining progress payments in full if the Engineer is satisfied with the progress and quality of the work. Such action on the part of the Engineer to reduce the retainage is strictly voluntary and at the sole discretion of the Engineer."

END OF SECTION

APPENDIX

PERMITS

TECHNICAL SPECIFICATIONS
TABLE OF CONTENTS

*****The Contractor shall note that the requirements of the Frederick County Standard Specifications are included by reference.*****

Division 10 - Specialties

Not Used

Division 11 - Equipment **Section**

Division 12 - Furnishings

Not Used

Division 13 - Special Construction

Not Used

Division 14 - Conveying Systems

Not Used

Division 15 - Mechanical **Section**

Division 16 – Electrical **Section**

SECTION 01100
SPECIAL PROVISIONS TO INSPECTIONS, TESTS, SCHEDULES AND REPORTS

All work shall be in accordance with Standard Specification Section 01100 - INSPECTIONS, TESTS SCHEDULES AND REPORTS, except as modified herein.

H. GENERAL

The provisions of Paragraph I.D.2 (critical path method construction schedule) do not apply to this Contract.

END OF SECTION

SECTION 01200
SPECIAL PROVISIONS TO CONTRACTOR'S DRAWINGS AND SUBMITTALS

All work shall be in accordance with the Standard Specification Section 01200-CONTRACTOR'S DRAWINGS AND SUBMITTALS, except as modified herein.

I. GENERAL

D. Record Drawings

1. After the words "keep one record copy of all", ADD "drawings,".

2. DELETE in its entirety and REPLACE with the following:

The Contractor shall furnish the Engineer one set of red-lined documents reflecting the types of changes described herein. Record Drawings shall include changes made to locations and elevations of buried and exposed piping, structures, equipment changes, substitutions and all variations from the Contract Documents. Record Drawings shall include changes made to the contract drawings by addendum.

ADD the new following paragraphs:

3. The Contractor and Engineer shall review and compare the Contractor's red-lined drawings to the Engineer's red-lined drawings and produce one agreed upon set of drawings. The Contractor shall deliver the aforesaid combined red-lined drawings to the Engineer-of-Record for approval. Once approved by the Engineer-of-Record the Contractor shall deliver the combined red-lined drawings along with the approved original signed project mylars to a drafting firm. The drafting firm shall complete as-built changes shown on the combined red-lined drawings directly to the original project mylars. Changes shall be made in red ink using standard symbols shown in the Standard Details. Changes shall not obscure or interfere with the legibility of the existing design work. Lettering must be a minimum of 0.1 inches in height. Eradication or erasures of existing design work is not permitted in order to facilitate placement of as-built information.

4. The Contractor shall return the combined red-lined drawings, approved mylars (with as-built changes), and a letter of certification from the drafting firm attesting that the reproducible were not altered with the exception of adding Contractor/Engineer changes. Allow thirty (30) days for Engineer's review and approval of as-built mylars.

5. Before project Conditional Acceptance and any payment for record drawings, all work aforesaid in Part I.D. of this Section must be completed to the satisfaction of the Engineer.

IV. MEASUREMENT AND PAYMENT

ADD the new following paragraphs:

B. Record Drawings

1. Record Drawings will not be measured for payment but will be paid for at the Contract

lump sum price provided in the Proposal Form.

END OF SECTION

SECTION 01800
SPECIAL PROVISIONS TO TEMPORARY FACILITIES AND ENVIRONMENTAL

All work shall be in accordance with Standard Specification Section 01800-TEMPORARY FACILITIES AND ENVIRONMENTAL PROTECTION, except as modified herein.

I. GENERAL

B. Temporary Facilities

Add the following:

f. The Contractor shall provide areas of parking for his construction personnel and coordinate these areas with the Engineer.

C. Temporary Utilities

The provisions of Section 5 (Engineers trailer) do not apply to this Contract.

D. Project Sign

The provisions of this Section do not apply to this Contract.

G. Frederick County Landfill Access

Contractor access through the Frederick County Landfill will be permitted between the hours of 7:00 AM and 5:00 PM Monday through Friday excluding holidays.

The use of off-road equipment on or crossing Landfill property paved roads will not be permitted. The contractor shall be responsible for any damage that occurs to Landfill roadways due to the contractor's operations.

The contractor shall be responsible at all times to maintain the existing gravel roads to a condition suitable for passenger vehicle access.

As directed by the engineer, the contractor shall be responsible for the maintenance of traffic of the Landfill roads used by the public or county personnel that are affected by the contractor's operations. The cost of maintenance of traffic shall be incidental to the Contract.

The contactor is responsible for dust control in accordance with contract documents. The contractor is responsible for providing all water needed for the contactor's use.

END OF SECTION

SECTION 03600
GROUT

PART 1.0 GENERAL

1.1 WORK INCLUDED

The CONTRACTOR shall furnish all materials, labor, and equipment necessary to place non-shrink grout where shown on the drawings or directed by the ENGINEER.

1.2 RELATED WORK

Cast-in-place concrete shall be in accordance with Section 03300.

1.3 SUBMITTALS

All pre-manufactured or premixed grout that is to be used by the CONTRACTOR shall be submitted to the ENGINEER for review. The grout used shall be manufactured for the anticipated use and submitted data from the manufacturer shall state the intended uses.

1.4 QUALITY ASSURANCE

1.4.1 Pre-manufactured grout work shall be conducted in accordance with the grouting manufacturer's instructions. Pre-manufactured grout used shall provide a one year warranty.

1.4.2 All grouting work shall be conducted in accordance with ASTM C404 and C476.

PART 2.0 PRODUCTS

2.1 PRE-MANUFACTURED GROUT

Pre-manufactured grout shall be in accordance with the U.S. Army Corps of Engineers, CRD-C-621, Handbook of Concrete and Cement, Specification for Non-shrink Grout, Volume II.

2.2 READY-MIXED GROUT

2.2.1 Materials shall be in accordance with ASTM C404 and C476.

2.3 NON-SHRINK GROUT

2.3.1 Non-shrink grout to be installed where indicated on the drawings, shall be Sika Grout 212, as manufactured by Sika Corporation, or equal.

PART 3.0 EXECUTION

3.1 GENERAL

3.1.1 Where indicated on the drawings, a grout fill shall be placed. Grout shall be cured as specified herein in Section 03300, Paragraph 3.10, "Curing."

3.1.2 Grout indicated to be placed beneath installed equipment shall be placed carefully in consideration of the directions of the manufacturer of the equipment.

END OF SECTION

SECTION 06100
ROUGH CARPENTRY

PART 1.0 GENERAL

1.1 DESCRIPTION OF WORK

1.1.1 Work Included

Provide all equipment and material including but not limited to wood, nails, bolts, screws, framing anchors and other rough hardware, and other items needed, and perform rough carpentry for the construction shown on the drawings, as specified herein, and as needed for a complete and proper installation.

1.2 QUALITY ASSURANCE

1.2.1 Use adequate numbers of skilled persons who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.2.2 Code and Standards

1.2.2.1 In addition to complying with the pertinent codes and regulations of governmental agencies having jurisdiction, comply with:

a. "Product Use Manual" of the Western Wood Products Association for selection and use of products included in that manual;
b. "Plywood Specification and Grade Guide" of the American Plywood Association;

1.3 PRODUCT HANDLING

1.3.1 Protection

1.3.1.1 Deliver the materials to the job site and store, in a safe area, out of the way of traffic, and shored up off the ground surface with adequate waterproof covering.

PART 2.0 PRODUCTS

2.1 GRADE STAMPS

2.1.1 Identifying framing lumber by the grade stamp of the Southern Pine Inspection Bureau.

2.1.2 Identify plywood as to species, grade, and glue type by the stamp of the American Plywood Association.

2.2 MATERIALS

2.2.1 Provide materials in the quantities needed for the work shown on the drawings, and meeting or exceeding the following standards of quality.

2.2.1.1 Horizontal framing members: Southern Pine No. 2

2.2.1.2 Vertical framing members: Southern Pine No. 2

2.2.1.3 Plywood:

a. Sheathing or Mounting Boards: Structural II, C-C, exterior.

b. Telephone backboard: 3/4" thick, A-D, group 1, interior.

2.2.1.4 Rough hardware:

a. Furnish rough hardware required to complete work of connections to metal studs or other materials.

b. Bolts, nuts, nails, and washers shall be hot dip galvanized conforming to ASTM A 153.

c. Rough hardware shall conform to the following:

a. Nuts shall conform to requirements of FSS FF-N-836.

b. Toggle bolts shall conform to requirements of FSS FF-B-588.

c. Lag screws and bolts shall conform to requirements of FSS-B-561.

d. Wood screws shall conform to requirements of FSS FF-S-111.

e. Nails and staples shall conform to requirements of FSS FF-N-105.

f. Joist hanger shall be 18 gauge zinc coated steel.

g. Metal cross bridging shall be 16 gauge zinc coated steel.

h. Strap anchors shall conform to requirements of ASTM A 525, 16 gauge zinc coated steel.

2.3 TREATED WOOD

2.3.1 Timber Perservatives

Preservatives and pressure treatment for timber shall meet the requirements of AASHTOM 133. The kind of treatment and amount of preservative shall be as specified in the Contract Documents.

a. Creosote

Timber treated with creosote solutions shall retain the following minimum quantities of preservatives:

For lumber in water and up to 5 feet above mean low water	12 pounds per cubic foot
For lumber 5 feet or more above mean low water and at or below ground	8 pounds per cubic foot

b. Oil-Borne Treatment

Oil-borne preservative treatment (other than creosote) shall have the following minimum dry net retention except as otherwise required by the Contract Documents.

AWPA Standard P 8

Pentachlorophenol (Southern Pine)	0.60 pounds per cubic foot
Pentachloropenol (Douglas Fir, Oak, Gum)	0.50 pounds per cubic foot

c. Water-Borne Treatment

Water-borne preservative treatment shall have the following minimum dry net retention except as otherwise required by the Contract Documents.

AWPA Standard P 5

Chromated Coper Arenate Type A, B, or C	0.40 pounds per cubic foot
Ammoniacal Copper Arsenate	0.50 pounds per cubic foot

d. Field Cuts

Lumber cut or drilled after treatment shall have cut surfaces brushcoated with the same preservative that was used at the plant.

2.4 OTHER MATERIALS

2.4.1 Provide other materials, not specifically described but required for a complete and proper installation, as selected by the CONTRACTOR subject to the approval of the OWNER.

PART 3.0 EXECUTION

3.1 SURFACE CONDITIONS

3.1.1 Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.2 COMPLIANCE

3.2.1 Do not permit materials not complying with the provisions of this Section to be brought onto or to be stored at the job site.

3.2.2 Promptly remove non-complying materials from the job site and replace with materials meeting the requirements of this Section.

3.3 WORKMANSHIP

3.3.1 Produce joints which are tight, true, and well nailed, with members assembled in accordance with the Drawings and with pertinent codes and regulations.

3.3.2 Selection of lumber pieces:

3.3.2.1 Carefully select the members.

3.3.2.2 Select individual pieces so that knots and obvious defects will not interfere with placing bolts or proper nailing, and will allow making of proper connections.

3.3.2.3 Cut out and discard defects which render a piece unable to serve its intended function.

3.3.2.4 Lumber may be rejected by the OWNER, whether or not it has been installed, for excessive warp, twist, bow, crook, mildew, fungus, or mold, as well as for improper cutting and fitting.

3.4 GENERAL FRAMING

3.4.1 General

3.4.1.1 In addition to framing operations normal to the fabrication and erection indicated on the drawings, install wood blocking and backing required for the work of other trades.

3.4.1.2 Set horizontal and sloped members with crown up.

3.4.1.3 Do not notch, cut, or bore members for pipes, ducts, or conduits, or for other reasons except as shown on the drawings or as specifically approved in advance by the OWNER.

3.4.2 Bearings

3.4.2.1 Make bearings full unless otherwise indicated on the drawings.

3.4.2.2 Finish bearing surfaces on which structural members are to rest so as to give sure and even support.

3.5 ALIGNMENT

3.5.1 On framing members to receive a finished surface, align the finish subsurface to vary not more than 1/8" from the plane of surfaces of adjacent furring and framing members.

3.6 INSTALLATION OF PLYWOOD SHEATHING

3.6.1 Placement

3.6.1.1 Place plywood with face grain perpendicular to support and continuously over at least two supports.

3.6.1.2 Center joints accurately over supports.

3.7 FASTENING

3.7.1 Nailing

3.7.1.1 Use only common wire nails or spikes of a dimension to provide penetration into the piece receiving the point of not less than 1/2 the length of the nail or spike, provided, however, that 16d nails may be used to connect two pieces of 2" (nominal) thickness.

3.7.1.2 Nail without splitting wood.

3.7.1.3 Remove split members and replace with members complying with the specified requirements.

3.7.2 Bolting

3.7.2.1 Drill holes 1/16" larger in diameter than the bolts being used.

3.7.2.2 Drill straight and true from one side only.

3.7.2.3 Do not bear bolt threads on wood, but use washers under head and nut where both bear on wood, and use washers under all nuts.

3.7.3 Screws

3.7.3.1 For lag screws and wood screws, prepare holes same diameter as root of threads, enlarging holes to shank diameter for length of shank.

END OF SECTION

SECTION 06192
TRUSSES

PART 1.0 GENERAL

1.1 DESCRIPTION

Prefabricated wood trusses include planar structural units consisting of metal plate connected members which are fabricated from dimension lumber and which have been cut and assembled prior to delivery to the job site.

1.2 QUALITY ASSURANCE

1.2.1 Comply with applicable requirements and recommendations of the following Truss Plate Institute (TPI) publications:

"Design Specification for Metal Plate Connected Wood Trusses".

"Commentary and Recommendations for Handling and Erecting Wood Trusses".

"Commentary and Recommendations for Bracing Wood Trusses".

"Quality Control Manual".

1.2.2 Comply with applicable requirements of "National Design Specification for Wood Construction" published by N.F.P.A.

1.2.3 Comply with PS 20 and with applicable rules of the respective grading inspecting agencies for species and grade of lumber indicated.

1.2.4 Provide truss connector plates manufactured by a firm which is a member of TPI and which complies with TPI quality control procedures for manufacture of connector plates published in TPI "Quality Control Manual".

1.2.5 Provide trusses by a firm which has a record of successfully fabricating trusses similar to type indicated and which complies with following requirements for quality control.

Fabricator shall practice a quality control program which complies with, or is comparable to, one published in TPI "Quality Control Manual" and which involves inspection by an independent inspection and testing agency acceptable to the Engineer.

1.3 SUBMITTALS

1.3.1 Submit fabricator's technical data covering lumber, metal plates, hardware, fabrication process, treatment (if any), handling and erection.

Submit certificate, signed by an officer of the fabricating firm, indicating that the trusses to be supplied for the project comply with indicated requirements.

Submit certification by treating plant that required fire-retardant treatment complies with specified standard and connector plate manufacturer other requirements, and by metal connector plate manufacturer that fire-retardant formulation is approved for use with plates for truss exposure indicated.

1.3.2 Submit shop drawings showing sizes and stress grades of lumber to be used; pitch, span, camber, configuration and spacing for each type of truss required; type, size, material finish, design value, and location of metal connector plates; and bearing and anchorage details.

1.3.3 Submit design analysis and test reports indicating loading, section modulus, assumed allowable stress, stress diagrams and calculations, and similar information needed for analysis and to ensure that trusses comply with requirements for roof systems dead loads and a 30 pounds per square foot live or snow load on the top chord and a 10 pound per square foot live load on the bottom chord.

1.3.4 Provide shop drawings which have been signed and stamped by a structural engineer licensed to practice in the State of Maryland.

1.4 DELIVERY, STORAGE & HANDLING

1.4.1 Handle and store trusses with care, and in accordance with manufacturer's instructions and TPI recommendations to avoid damage from bending, overturning or other cause for which truss is not designed to resist or endure.

1.4.2 Time delivery and erection of trusses to avoid extended on-site storage.

PART 2.0 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

Subject to compliance with requirements, manufacturers offering metal connector plates which may be incorporated in the work include, but are not limited to, the following:

Alpine Engineered Products, Inc.
Clary Corporation
Gang Nail Systems, Inc.
Hydro-Air Engineering, Inc.
Inter-Lock Steel Co., Inc.
Link-Wood Construction Systems
Lumbermate Company
Robbins Manufacturing Co.
The Panel-Clip Company

Structomatic, Inc.
Tee-Lok Corp.
Truss Connectors of America
Truswall Systems Corp.
Woodco Ltd.

2.2 MATERIALS

2.2.1 Lumber

2.2.1.1 Factory mark each piece of lumber with type, grade, mill and grading agency.

2.2.1.2 Any softwood, at Fabricator's option, as required to comply with other requirements.

2.2.1.3 Any grade of lumber fulfilling requirements indicated for species, stress ratings, and moisture content.

Provide lumber which has been graded or tested and certified, at indicated moisture content, to be in compliance with stress ratings shown on drawings.

2.2.2 Metal Connector Plates, Fasteners & Anchorages

2.2.2.1 Metal complying with following requirements, unless otherwise indicated; not less than 0.036 thick, coated thickness (Contractor's option if more than one metal indicated).

2.2.2.2 Galvanized Sheet Steel, ASTM A 446, Grade A, Coating G60.

2.2.2.3 Electrolytic Zinc Coated Steel Sheet, ASTM A 591, Coating Class C, with minimum structural quality equivalent to ASTM A 446, Grade A.

2.2.2.4 Stainless Steel, ASTM A 167, Type 304, with minimum structural quality equivalent to ASTM A 446, Grade A.

2.2.3 Fasteners & Anchorages

Provide size, type, material and finish indicated, complying with applicable Federal Specifications for nails, screws, bolts, nuts and washers and anchoring devices.

2.3 WOOD TREATMENT

2.3.1 All lumber used to fabricate the trusses shall be pressure treated in accordance with AWPA C-1 and C-2. Retention of CCA shall be 0.4 pounds per cubic foot.

2.3.2 Kiln-dry lumber after treatment to a moisture content of 19% or less.

2.3.3 Inspect each piece of treated lumber after drying and discard damaged or defective pieces.

2.4 FABRICATION

2.4.1 Cut truss members to accurate lengths, angles and sizes to produce close fitting joints with wood-to-wood bearing in assembled units.

2.4.2 Fabricate metal connector plates to size, configuration, thickness and anchorage details required for types of joint designs indicated.

2.4.3 Assemble truss members in design configuration indicated using jigs or other means to ensure uniformity and accuracy of assembly with close fitting joints. Position members to produce design camber.

PART 3.0 EXECUTION

3.1 GENERAL

3.1.1 Erect trusses with plane of truss webs vertical (plumb) and parallel to each other, located accurately at design spacings indicated.

3.1.2 Hoist units in place by means of lifting equipment suited to sizes and types of trusses required, applied at designed lift points as recommended by fabricator, exercising care not to damage truss members or joints by out-of-plane bending or other causes.

3.1.3 Provide temporary bracing as required to maintain trusses plumb, parallel and in location indicated, until permanent bracing is installed.

3.1.4 Anchor trusses securely at all bearing points to comply with methods and details indicated.

3.1.5 Install permanent bracing and related components to enable trusses to maintain design spacing, withstand live and dead loads including lateral loads, and to comply with other indicated requirements.

3.1.6 Do not cut or remove truss members.

END OF SECTION

SECTION 07310
ROOFING AND SHINGLES

PART 1.0 GENERAL

1.1 DESCRIPTION OF WORK

Furnish all labor, equipment and materials necessary for the complete installation of all required roofing, including felt, shingles, trim, ridge vent, and flashing.

1.2 SUBMITTALS

Description Literature:

1.2.1 Color catalog showing the shingle manufacturer's standard colors.

1.2.2 Shingle manufacturer's descriptive literature including: type, weight, class, UL labels, and installation instructions of shingle to be supplied.

1.2.3 Descriptive literature for roofing felt indicating conformance with specifications.

Samples:

1.2.4 Submit two sets of manufacturer samples showing actual color of shingles.

1.3 DELIVERY AND STORAGE

Deliver materials to the building site in the manufacturer's unopened bundles and containers with the manufacturer's brand name marked clearly thereon. Keep materials dry, covered completely, and protected from the weather. Store according to manufacturer's written instructions.

1.4 WARRANTIES

Warranties shall begin on the date of the OWNER'S acceptance of the work.

1.4.1 Manufacturer's Warranty: The CONTRACTOR shall furnish the shingle manufacturer's standard 30-year warranty for the asphalt shingles. The warranty shall run directly to the OWNER.

1.4.2 Contractor's Warranty: The CONTRACTOR shall warrant for not less than 1 year from the date of acceptance of the work that the asphalt shingle roofing system as installed is free from defects in workmanship. If repairs due to defective workmanship are required at any time while the roofing system is under the CONTRACTOR'S warranty, the CONTRACTOR shall make such repairs within 72 hours of notification.

1.5 SINGLE SUBCONTRACTOR

Subcontract the roofing and associated work to a single firm specializing in the type of roofing required, so that there will be undivided responsibility for the specified performance of all components parts, including the following (even though some parts may be sub-subcontracted to other):

1.5.1 Vapor barriers under roofing.

1.5.2 Asbestogard felts, roofing felts.

1.5.3 Insulation under roofing, but not including poured cement insulation.

1.5.4 Preformed cant strips.

1.5.5 Roofing including composition flashing.

1.5.6 Flashing in connection with roofing.

1.6 ACCEPTABLE SUBCONTRACTOR

Engage a roofing subcontractor who is acceptable to the manufacturer of the primary roofing materials.

1.7 PROCEDURE

Proceed with roofing and associated work only after curbs, blocking, nailer strips, vents, drains and other projections through the roof have been installed, and when the deck construction and framing of openings is completed.

1.8 SUBCONTRACTOR MEETING PRIOR TO CONSTRUCTION

Prior to installation of roofing and associated work, the roofing subcontractor shall meet at the project site with the CONTRACTOR, the installer of each component of the associated work, the representative of the primary roofing materials manufacturer, inspection and testing agency representatives (if any), installers of other work requiring coordination with the roofing work, and the ENGINEER, for the purpose of reviewing the material selections and procedures to be followed in performing the work in compliance with the requirements specified.

1.9 WEATHER CONDITIONS

Proceed with roofing and associated work only when existing and forecasted weather conditions will permit the work to be performed in accordance with manufacturer's recommendations, and the established procedures and schedule. Proceed only when the roofing subcontractor is willing to guarantee the work as required, without additional reservations or restrictions.

1.10 WORKING IN UNFAVORABLE WEATHER CONDITIONS

Record in writing (to the OWNER with copy to the ENGINEER), any decision or agreement to proceed with the work under unfavorable weather conditions. State the reasons for proceeding and the name of the persons involved in the decision.

PART 2.0 PRODUCTS

2.1 ASPHALT SHINGLES

Asphalt shingles shall be made from multiple glass felts and surfaced with mineral granules. Each glass felt shall be a thin porous sheet composed predominately of fine glass fibers uniformly deposited in a nonwoven pattern. Each glass felt shall be reinforced with random or parallel-oriented glass yarns, or both, which may be gathered or twisted, bonded or unbonded. The felt shall contain a substantially water-insoluble binding agent. Each glass felt shall be impregnated with an asphaltic material and the mats shall be adhered to each other with a continuous layer of asphaltic material between adjacent felts. The nature of the asphaltic layers shall ensure a firm bond between adjacent glass felts. The single felt or laminated felts shall then be coated on both sides with a hot asphaltic coating. The weather side shall be completely surfaced with mineral granules embedded in the asphaltic coating, of a color to be selected by the

OWNER. The reverse side shall be covered with a suitable material such as pulverized sand, talc, or mica to prevent the shingles from sticking together in the package. The shingles shall have a factory-applied adhesive that will seal the shingles together after installation. All shingles shall be manufactured in accordance with ASTM 3462.

2.2 ASPHALT SATURATED FELT

Roofing felt shall be asphalt saturated organic Type-I conforming to ASTM D-226 having a mass of saturant weighing 30# per 100 square feet.

2.3 NAILS

Nails for shingles and asphalt-saturated felt shall be hot-dipped galvanized steel or aluminum with flat heads 3/8 inch to 7/16 inch in diameter and sharp points. Steel nails shall have annular threads; aluminum nails shall have screw threads. Shank diameter of nails shall be not less than 0.105 inch and not more than 0.135 inch. The nails shall be long enough to penetrate and extend not less than 3/4 inch into the roof deck when driven through the material to be fastened.

2.4 ASPHALT ROOF CEMENT

Asphalt roof cement shall consist of an asphalt base, volatile petroleum solvents, and mineral stabilizers including asbestos fiber, mixed to a smooth, uniform consistency suitable for trowel application and shall be manufactured in accordance with ASTM D-2822 Type-II.

2.5 TRIM

2.5.1 Facia: .040 aluminum alloy 6063.T52 with duronodic baked on enamel. Alcoa or equal. Fasten with color matched aluminum nails.

2.5.2 Soffit (Ventilated): .032 aluminum alloy 6063-T52 with duronodic baked on enamel. Sheet width 12 inch wide with interlocking V-Grove. Alcoa or equal.

2.5.3 Roof Edge Guard: aluminum alloy 6063-T52 with baked on duronodic. Alcoa or equal.

2.5.4 Ridge Vent: .040 aluminum alloy 6063-T52 with 1/8" x 1" openings screened inside. Type RLV, Lomanco or equal.

2.6 BASE FLASHING, VENT STACK FLASHING

Flexi-Flash 62 waterproof polyvinyl chloride resin base sheet 62 mil thickness as manufactured by Afro Products, Inc. or equal with Flexi-Flash Adhesive for bonding as manufactured by Afro Products, Inc. or equal.

2.7 PLYWOOD SHEETING

2.7.1 Plywood sheeting shall be manufactured in conformance with PS – 2, Performance Standard for Wood-Based Structural-Use Panels. Plywood sheeting shall conform to the 2000 Residential Code, and the 2000 International Building Code.

2.7.2 Design capacities of plywood shall conform to ICC ESR-1785.

2.7.3 Sheeting shall bear the stamp of TECO, an approved inspection and testing agency.

2.7.4 Plywood sheeting shall be recognized as having a Class C (III) flame spread rating.

2.7.5 Plywood shall be as manufactured by AdvanTech, or equal.

PART 3.0 EXECUTION

3.1 SURFACES AND CONDITIONS

Do not apply shingle roofing on surfaces that are unsuitable or that will prevent a satisfactory application. Ensure that roof deck is smooth, clean, dry, and without loose knots. Cover knotholes and cracks with sheet metal nailed securely to the sheathing. Properly flash and secure vents and other roof projections and drive projecting nails firmly home.

3.2 APPLICATION

The manufacturer's written instructions shall be followed for applications not listed in this specification and in cases of conflict with this specification.

3.3 UNDERLAYMENT

Apply underlayment consisting of one layer of 30# asphalt-saturated felt to the roof deck. Lay felt parallel to roof eaves continuing from eaves to ridge, using 2-inch head laps, 6-inch laps from both sides over all hips and ridges, and 4-inch end laps in the field of the roof. Nail felt sufficiently to hold until shingles are applied.

3.4 METAL DRIP EDGES

Provide metal drip edges applied directly on the wood deck at the eaves and over the underlayment at the rakes. Extend back from the edge of the deck not more than 3 inches and secure with fasteners spaced not more than 10 inches on center along the inner edge.

3.5 STARTER STRIP

Apply a starter strip at the eaves, consisting of a 9-inch wide strip of mineral-surfaced roll roofing of a color to match the shingles, or a row of shingles with tabs cut off may be used as the starter strip. Apply the starter strip along the eaves, overlaying and finishing even with the lower edge of the eaves flashing strip; fasten in a line parallel to, and 3 to 4 inches above, the eave edge. Place fasteners so that the top of the fastener will not be exposed in the cutouts of the first course of shingles.

3.6 SHINGLE COURSES

Start the first course with a full shingle and apply succeeding courses with the joints staggered at third or halves. Application of shingle courses shall be as follows unless specified otherwise by the manufacturer's printed application instructions:

3.6.1 General: Do not drive fasteners into or above the factory applied adhesive. Place all fasteners so that they are concealed by the shingle top lap and so that they penetrate the head lap of the overlapped shingle. Top lap is considered to be that portion of a shingle overlapping the shingle in the course below. Head lap is considered to be that portion of a shingle extending from the top edge of the shingle in the course below to the butt edge of the shingle in the courses above.

Exposure is considered to be that portion of a shingle between exposed butt edges of overlapping courses of shingles.

3.6.2 Shingles Applied With Nails: Nominal 5-inch exposure. Apply each shingle with not less than 4 nails. Place one nail one inch from each end and evenly spaced nails on a horizontal line not less than 5/8 inch above the tops of cutouts. Cement tab using asphalt roof cement in areas where self-stick is not apparent.

3.7 VENT AND STACK FLASHING

Apply shingles up to the point where vent or stack pipe projects through the roof and cut the nearest shingle to fit around the pipe. Before shingles are applied beyond the pipe, prepare the flange of pipe vent flashing by coating the bottom side of the flashing flange with asphalt roof cement 1/8-inch thick. Slip the flashing collar and flange over the pipe and set the coated flanged in a 1/16-inch coating of asphalt roof cement. After the flashing flange is applied, continue shingling up the roof. Lap the lower part of the flange over the shingles. Cover the flange with shingles along the sides and at the back of the pipe. Fit shingles around the pipe and embed in a 1/16-inch thick coating of asphalt roof cement where they overlay the flange.

3.8 CONTRACTOR INSPECTION

The roofing subcontractor shall advise the CONTRACTOR of required procedures for surveillance and protection of the completed roofing during the remainder of the construction period. At the time of final acceptance by the OWNER, the roofing subcontractor (with copy to OWNER) of any discrepancies or damage found.

3.9 REPAIRS

Restore or repair deterioration or damage, so that there will be no question concerning the condition of the roofing and associated work at the time of final acceptance.

3.10 FAILURE

It is required that the roofing and associated work be watertight and not deteriorate excessively or at rates more rapid than indicated by manufacturer's published literature. Any failure of the work to comply with these requirements will be considered a failure of materials and workmanship under the guarantee.

3.11 PERFORMANCE

It is intended that the whole system of roofing and associated work, under normal conditions and with normal maintenance, will perform without failure, including any necessity for excessive maintenance, for 10 years after the time of final acceptance.

3.12 WIND BLOW-OFF FAILURE

Wind blow-off of roofing or associated work will be considered a failure of materials and/or workmanship, unless there is a reasonable evidence that the failure occurred at a time when wind velocities at the project site exceeded 100 m.p.h.

END OF SECTION

SECTION 07464
VINYL SIDING

PART 1.0 GENERAL

1.1 SECTION INCLUDES

1.1.1 Vinyl siding

1.1.2 Vinyl soffits.

1.1.3 Accessories and trim.

1.2 RELATED SECTIONS

1.2.1 Section 06100 - Rough Carpentry

1.3 REFERENCES

1.3.1 ASTM D 635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.

1.3.2 ASTM D 638 - Standard Test Method for Tensile Properties of Plastics.

1.3.3 ASTM D 648 - Test Method for Deflection Temperature of Plastics Under Flexural Load.

1.3.4 ASTM D 696 - Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30 Degrees C and 30 Degrees C.

1.3.5 ASTM D 790 -- Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

1.3.6 ASTM D 1435 - Standard Practice Method for Outdoor Weathering of Plastics.

1.3.7 ASTM D 1929 - Standard Test Method for Ignition Properties of Plastics.

1.3.8 ASTM D 2843 - Standard Test Method for Density of Smoke from the Burning or Decomposition of Plastics.

1.3.9 ASTM D 3679 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Siding.

1.3.10 ASTM D 4101 - Standard Specification for Propylene Plastic Injection and Extrusion Materials.

1.3.11 ASTM D 4216 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Related Plastic Building Product Compounds.

1.3.12 ASTM D 4226 - Standard Test Method for Impact Resistance of PVC Building Products.

1.3.13 ASTM D 4477 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Soffit.

1.3.14 ASTM D 5206 - Standard Windload Resistance Test.

1.3.15 ASTM E 84 - Standard test Method for Surface Burning Characteristics of Building Materials.

1.3.16 ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

1.4 PERFORMANCE REQUIREMENTS

1.4.1 PVC Fire Resistance: Provide vinyl siding products that meet or exceed the following ratings:

1.4.1.1 Flame spread index 20, fuel contribution 0, smoke development rating 360, per ASTME 84.

1.4.1.2 Self-ignition temperature: 824 degrees F (440 degrees C) per ASTM D 1929.

1.4.1.3 Fire endurance classification of 1 hour, per ASTM E 119 as wall assembly.

1.4.2 Cedar Impressions Perfection and Half-Round Siding: TPO Fire Resistance: Provide thermoplastic polyolefin siding products that meet or exceed the following ratings:

1.4.2.1 Minimum self-ignition temperature of 650 degrees F (343 degrees C), per ASTM D1929.

1.4.2.2 Smoke density rating of 40, per ASTM D 2843.

1.5 SUBMITTALS

1.5.1 Submit under provisions of Section 01300.

1.6 QUALITY ASSURANCE

1.6.1 Installer Qualifications: Provide installer with not less than three years of experience with products specified or has obtained Master Craftsman credentials from CertainTeed.

1.6.2 Mock-Up: Provide a mock-up for evaluation of installation techniques and workmanship.

1.6.2.1 Finish areas designated by Architect.

1.6.2.2 Do not proceed with remaining work until workmanship and color is approved by Architect.

1.6.2.3 Reinstall mock-up area as required to produce acceptable work.

1.7 DELIVERY, STORAGE, AND HANDLING

1.7.1 Store products in manufacturer's unopened packaging until ready for installation.

1.8 PROJECT CONDITIONS

1.8.1 Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.9 WARRANTY

1.9.1 Provide manufacturer's standard lifetime limited warranty on siding products, transferable to new owners.

PART 2.0 PRODUCTS

2.1 MATERIALS

2.1.1 Polyvinyl Chloride: Provide siding and soffit materials made of PVC compound with cell classification of 13344-B, as defined by ASTM D 4216, that meets or exceeds the following properties:

2.1.1.1 Impact strength: 2.20 ft-lbs per inch at test temperature of 73 degrees F. (22.7 degrees C.), and 1.30 ft-lbs per inch at test temperature of 32 degrees F (0 degrees C), per ASTM D 4226.

2.1.1.2 Tensile strength: 7,344 psi (50,637 kPa).

2.1.1.3 Flexural modulus of elasticity in tension: 455,750 psi (3,142,396 kPa).

2.1.1.4 Deflection temperature under load of 264 psi (1820 kPa): 168 degrees F (76 degrees C).

2.1.1.5 Coefficient of expansion: .000034 in/in/degree F.

2.1.1.6 Chemical resistance: Excellent.

2.1.2 Vinyl Components: Provide products made of extruded polyvinyl chloride as specified in this section and manufactured to comply with requirements of ASTM D 3679.

2.1.2.1 Provide elongated nailing slots on nailing flanges to allow for movement.

2.1.2.2 Factory-notch ends of horizontal panels to form overlapping joints.

2.1.2.3 Provide products that meet weathering requirements of ASTM D 3679.

2.2 VINYL SIDING

2.2.1 Classic:

2.2.1.1 Design: Double 5 inch (127 mm) clapboard.

2.2.1.2 Nail Hem: RigidForm 180 Technology Roll Over Nail Hem or equal.

2.2.1.3 Lock: DuraLock or equal post formed lock design.

2.2.1.4 Width: 10 inches (254 mm) plus or minus .062 inch (1.57 mm).

2.2.1.5 Length: 12 feet (3.66 m) plus or minus .025 inch (6 mm).

2.2.1.6 Average Thickness: 0.044 inch (1.1 mm).

2.2.1.7 Panel Projection: 5/8 inch (15.9 mm).

2.2.1.8 Exposure: 5 inches (127 mm) single nailing hem with patented stabilizer reinforcement.

2.2.1.9 Maximum Warp (per 2 panels): 0.250 inch (6 mm).

2.2.1.10 Color: As selected by the Owner.

2.3 VINYL CARPENTRY SOFFITS

2.3.1 Soffit, solid.

2.3.1.1 Design: Double 5 inches (127 mm); solid matte finish.

2.3.1.2 Width: 10 inches (254 mm) plus or minus .062 inch (1.57 mm).

2.3.1.3 Length: 12 feet (3.66 m) plus or minus) .025 inch (6 mm)

2.3.1.4 Average Thickness: 0.038 inch (1.0 mm).

2.3.1.5 Exposure: 5 inches (127 mm) single nailing hem.

2.3.1.6 Maximum Warp (per 2 panels): 0.250 inch (6 mm).

2.3.1.7 Color shall be selected by the Owner.

2.3.2 Soffit, fully vented.

2.3.2.1 Design: Double 5 inches (127 mm); matte finish.

2.3.2.2 Width: 10 inches (254 mm) plus or minus .062 inch (1.57 mm).

2.3.2.3 Length: 12 feet (3.66 m) plus or minus) .025 inch (6 mm)

2.3.2.4 Average Thickness: 0.038 inch (1.0 mm).

2.3.2.5 Exposure: 5 inches (127 mm) single nailing hem.

2.3.26 Maximum Warp (per 2 panels): 0.250 inch (6 mm).

2.3.2.7 Ventilation: 5.850 inches per sq. ft.

2.3.2.8 Color shall be as selected by the Owner.

2.3.3 Soffit Accessories:

2.3.3.1 J-Channel: 3/8 inch (10 mm) by 12 feet, 6 inch (3.81 m) length, for vertical and eave applications.

2.3.3.2 F-Channel: 5/8 inch (15.88 mm) and 3/4 inch (19 mm) by 12 feet 6 inches (3.81 m) length.

2.3.3.3 Soffit Double Channel Lineal: 3/8 inch (10 mm) or 1/2 inch (12.7 mm) by 12 feet, 6 inches (3.81 m) length, for eave applications.

2.3.3.4 Soffit Cove Trim: 1/2 inch (12.7 mm) by 12 feet, 6 inches (3.81 m) length.

2.3.3.5 Color: Match soffit color.

2.4 VINYL CARPENTRY ACCESSORIES

2.4.1 Standard Accessories:

2.4.1.1 Corner post: Standard width, 10 feet (3.05 m) and 12 feet (3.66 m) lengths.

2.4.1.2 J-Channel: Standard width, 12 feet, 6 inches (3.81 m) length.

2.4.1.3 Undersill trim.

2.4.1.4 Dual undersill trim: 12 feet 6 inches (3.81 m) length.

2.4.1.5 2-1/2 inch (64 mm) Metal Starter Strip.

2.5 FASTENERS

2.5.1 Provide galvanized or other corrosion-resistant nails as recommended by manufacturer of siding products.

PART 3.0 EXECUTION

3.1 EXAMINATION

3.1.1 Do not begin installation until substrates have been properly prepared.

3.1.2 If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

3.2.1 Examine, clean, and repair as necessary any substrate conditions which would be detrimental to proper installation.

3.2.2 Do not begin installation until unacceptable conditions have been corrected.

3.3 INSTALLATION

3.3.1 Install products in accordance with the latest printed instructions of the manufacturer.

3.3.2 Install products with all components true and plumb.

3.3.3 Nail horizontal panels by placing nail in center of slot. Nail vertical panels by placing first nail at top of top slot and remaining nails in center of slots. Drive nails straight, leaving 1/16 inch (1.6 mm) space between nail head and flange of panel.

3.3.4 Allow space between both ends of siding panels and trim for thermal movement. Overlap horizontal panel ends one-half the width of factory pre-cut notches.

3.3.5 Stagger lap joints in horizontal siding in uniform pattern as successive courses of siding are installed.

3.3.6 Install J-channel and flashing to accommodate successive courses of vertical siding. Install wood shims at building corners to bring cut edges of vertical siding out to correct plane.

3.4 PROTECTION

3.4.1 Protect installed products until completion of project.

3.4.2 Touch-up, repair or replace damaged products before Substantial Completion.

3.5 CLEANING

3.5.1 At completion of work, remove debris caused by siding installation from project site.

END OF SECTION

SECTION 09900
PAINTING

PART 1.0 GENERAL

1.1 DESCRIPTION OF WORK

1.1.1 Work Included

1.1.1.1 The type of material to be used and the number of coats to be applied are listed in the "Schedule of Painting" in PART 3.0 of this Section of these specifications.

1.1.1.2 In general the work includes shop and field painting of all surfaces as shown on the "Schedule of Painting" including color coding of plant process piping. The Contractor shall paint or coat all structural steel, miscellaneous metal, equipment, piping, tanks, poured concrete, plate steel and any other work normally requiring paint for protection against weather or corrosion.

1.1.1.3 Where equipment has not received shop painting the Contractor shall provide the required surface preparation and primer prior to application of the finish coats.

1.1.1.4 All surfaces which shall be concealed after installation shall be primed with the specified interior coat paint.

1.1.2 Definitions

The term "paint," as used herein, includes enamel paints, sealers, fillers, emulsions, and other coatings whether used as prime, intermediate or finish coats.

1.2 QUALITY ASSURANCE

1.2.1 Qualifications of Painters

1.2.1.1 Only qualified journeyman painters shall be used for the mixing and application of paint on exposed surfaces in the acceptance or rejection of installed painting, no allowances will be made for lack of skill on the part of painters.

1.2.1.2 Well in advance of commencement of painting the Contractor shall submit the name and experience of the painting Subcontractor. Approval of the painting Subcontractor by the Owner's Representative shall be based upon a determination that this subcontractor is experienced enough to do the type of work required under the contract.

1.2.2 Codes & Standards

In addition to complying with all pertinent codes and regulations, comply with "Standard (Type 1)" as defined by the Painting and Decorating Contractors of America in their "Modern Guide to Paint Specification, " latest edition.

1.3 SUBMITTALS

1.3.1 Materials List

1.3.1.1 Before any paint materials are delivered to the job site, submit to the ENGINEER in accordance with the provisions of Section 01200 of the Standard Specifications a complete list of all materials proposed to be furnished and installed under this portion of the work.

1.3.1.2 This shall in no way be construed as permitting substitution of materials for those specified by the Engineer or approved for this Work by the ENGINEER.

1.3.1.3 Safety Color Codes as specified in the Occupational Safety and Health Act of 1970 shall be required as part of this contract.

1.3.2 Samples

1.3.2.1 Accompanying the materials list, submit to the ENGINEER two copies of the full range of colors available in each of the proposed products.

1.3.2.2 Paint colors shall be as hereinafter specified or as selected by the Owner. The Contractor shall provide the Owner with color chips in the selection of colors.

1.3.2.3 Before any finish painting is done, the Contractor shall obtain from the Owner the final selected color chips and a schedule showing where the various colors shall be used. The Contractor shall then prepare samples at the job as required until the colors and textures are satisfactory.

1.3.2.4 If standard color charts are not acceptable to the Owner in accordance with the requirements of the color scheme specified, the Contractor shall provide tinting and matching to the satisfaction of the Owner.

1.3.3 Maintenance Requirements for Painted Surfaces

Upon satisfactory completion of all painting, the CONTRACTOR shall provide a manual which shall include all information necessary to properly

maintain all painted surfaces in quality condition. The information required will include:

1.3.3.1 Paint Manufacturer - Name and address and local distributor.

1.3.3.2 Product Description - Name, Type, or Number

1.4 PRODUCT HANDLING

1.4.1 Delivery

Deliver all paint materials to the job site in their original unopened containers with all labels intact and legible at time of use.

1.4.2 Protection

1.4.2.1 Store only the approved materials at the job site, and store only in a suitable and designated area restricted to the storage of paint materials and related equipment.

1.4.2.2 Use all means necessary to ensure the safe storage and use of paint materials and the prompt and safe disposal of waste.

1.4.2.3 Use all means necessary to protect paint materials before, during and after application and to protect the installed work and materials of all other trades.

1.4.3 Replacements

In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner's Representative and at no additional cost to the OWNER.

PART 2.0 PRODUCTS

2.1 PAINT MATERIALS

2.1.1 Manufacturer

2.1.1.1 All paint materials selected for coating for each type of surface shall be the product of a single manufacturer.

2.1.1.2 Paint materials shall be acceptable products of Tnemec Co., or equal. All references in Part 3.10 "Schedule of Painting" are for products manufactured by Tnemec Co.

2.1.1.3 Products of named companies require no further approval as to manufacture or catalog number. Products of other manufacturers may be used subject to approval by the

ENGINEER of the materials list and manufacturer's product data sheet and recommendations required to be submitted under Part 1.3 herein.

2.1.2 Compatibility

2.1.2.1 All paint materials and equipment shall be compatible in use; finish coats shall be compatible with prime coats, prime coats shall be compatible with the surface to be coated and all tools and equipment shall be compatible with the coating to be applied.

2.1.2.2 Thinners, when used, shall be only those thinners recommended for that purpose by the manufacturer of the material to be thinned.

PART 3.0 EXECUTION

3.1 SURFACE CONDITIONS

3.1.1 Inspection

3.1.1.1 Prior to all work of this Section, the Contractor shall carefully inspect the installed work, of all other trades and verify that all such work is complete to the point where this installation may properly commence.

3.1.1.2 The Contractor shall verify that paint finishes may be applied in strict accordance with all pertinent codes and regulations and the requirements of these Specifications.

3.1.2 Discrepancies

3.1.2.1 In the event of discrepancy, immediately notify the ENGINEER.

3.1.2.2 Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.2 PREPARATION OF SURFACES, GENERAL

3.2.1 Protection

Prior to all surface preparation and painting operations, completely mask, remove, or otherwise adequately protect all hardware, nameplates, accessories, machined surfaces, plates, lighting fixtures, and similar items in contact with painted surfaces not scheduled to received paint.

3.2.2 Priming

Spot prime all exposed nails and other metals which are to be painted with emulsion paints using a primer recommended by the Manufacturer of the coating system.

3.2.3 Cleaning

3.2.3.1 Before applying paint or other surface treatment, thoroughly clean all surfaces involved.

3.2.3.2 Schedule all cleaning and painting so that dust and other contaminants from the cleaning process will not fall on wet or newly painted surfaces.

3.3 PREPARATION OF SURFACES, SPECIFIC

3.3.1 Ferrous Metal Surfaces

3.3.1.1 Ferrous metal surfaces subject to continuous or intermittent immersion, except for inside of pipes, shall be sandblasted to a Near-White Grade in accordance with Specification SSPC-SP-10. All blasted surfaces must be coated the same day as blasted.

3.3.1.2 All other ferrous metal surfaces subject to normal industrial exposure shall be sandblasted to a Commercial Grade in accordance with Specification SSPC-SP-6. All blasted surfaces must be coated the same day as blasted.

3.3.1.3 Where approved, pickling of ferrous metal surfaces may be substituted for sandblasting. Pickling shall be in accordance to Specification SSPC-SP-8.

3.3.1.4 Where, in the opinion of the ENGINEER it is not practical or possible to sandblast or prickle, ferrous metals may be prepared for painting by Power Tool Cleaning in accordance to Specification SSPC-SP-3 or by Hand Tool Cleaning in accordance to Specification SSPC-SP-2.

3.3.1.5 Removal of grease, oils, tars and other contaminants shall be in accordance to Specification SSPC-SP-1, Solvent Cleaning.

3.3.2 Concrete

3.3.2.1 All concrete surfaces shall be cleaned of all dust, dirt, form oil, curing compounds and other foreign matter by Brush-off Blast Cleaning, in accordance with SSPC Surface Preparation Specification No. 7.

3.3.2.2 Concrete floors shall be etched with a 15-20 percent solution of muriatic acid. Etched floors shall have the granular appearance of fine sandpaper and shall be re-etched to attain uniformity, if required. After etching, all acid shall be flushed off with clean water.

3.4 PAINT APPLICATION

3.4.1 Coating shall be applied in accordance with Paint Manufacturer's recommendations and may be subject to inspection, at all times by representatives of the OWNER or Manufacturer.

3.4.2 All spray equipment shall be inspected and approved by the owner's Representative before paint application is begun.

3.4.3 A moisture trap shall be placed in line from air supply to pressure pot and spray gun. This trap shall be opened slightly to provide a continuous bleed.

3.4.4 Regulators and gauges shall be provided for air to both pressure pot and spray gun.

3.4.5 All sand and dust from blasting operations shall be removed from surfaces before painting application is begun.

3.4.6 Blasted surfaces shall be coated with one coat of primer during the same day that blasting was done.

3.4.7 Primer shall not be applied closer than 6 inches to a non-blasted area. Any subsequent blasting operation shall not result in sand particles embedded in the paint films.

3.4.8 No painting shall take place when the temperature is below 50 degrees, F., when the surface temperature is less than five degrees above the dew point, or when relative humidity is above 85 percent, unless approved by the representative of the OWNER or Paint Manufacturer.

3.4.9 Spray guns must be held perpendicular to the surfaces being painted and handled and adjusted in such a manner that dry overspray is held to a minimum.

3.4.10 The sequence to be followed in painting shall be such that a minimum of damage to finished coatings will result.

3.4.11 When paint is being applied to the interior of tanks or confined areas, sufficient blowers and fans shall be installed to provide adequate ventilation.

3.4.12 Paint Manufacturer and ENGINEER will be consulted concerning points not covered in these specifications.

3.4.13 Where more than one coat of paint is required, the undercoats shall be a shade lighter than succeeding coats to insure complete coverage.

3.5 INSPECTION

3.5.1 General

Do not apply additional coats until completed coat has been inspected and approved by the Owner Representative.

3.5.2 Number of Coats

Only inspected and approved coats of paint will be considered in determining the number of coats applied.

3.6 DRY MIL THICKNESS

3.6.1 General

Apply all coatings to the dry mil thickness indicated in the Schedule of Painting.

3.6.2 Measurement

Provide and use a "Tooke Dry Film Thickness Gauge," or other gauge approved by the ENGINEER, to prove the dry mil thickness of a paint applied.

3.7 REINSTALLATION OF REMOVED ITEMS

Following completion of painting in each space, promptly reinstall all items removed for painting, using only workmen skilled in the particular trade.

3.8 CLEANING UP

3.8.1 General

3.8.1.1 During progress of the Work, do not allow the accumulation of empty containers or other excess items except in areas specifically set aside for that purpose.

3.8.1.2 Prevent accidental spilling of paint materials and, in event of such spill, immediately remove all spilled material and the waste or other equipment used to clean up the spill, and wash the surfaces to their original undamaged condition, all at no additional cost to the OWNER.

3.8.2 Prior to Final Inspection

Upon completion of this portion of the work, visually inspect all surfaces and remove all paint and traces of paint from surfaces not scheduled to be painted.

3.9 PAINTING SCHEDULE

3.9.1 General

3.9.1.1 In general, equipment except major electrical equipment (see 3.11) previously shop painted with the Manufacturer's standard paint system shall be repainted with colors to suit the area of installation. The ENGINEER may, at his option, require that certain equipment not be painted.

3.9.1.2 Imperfections and scratches on equipment not repainted shall be touched up with matching paint provided by the equipment Manufacturer.

3.9.1.3 Aluminum, brass, and stainless steel surfaces shall not be painted.

3.9.1.4 All pipes and other metals that have been dipped in tar or bituminous products shall received two (2) coats of anti-bleeding sealer, Tnemec, 707, Tar Bar or equal, in place of priming coat.

3.10 SCHEDULE OF PAINTING

3.10.1 Submerged Metal

3.10.1.1 All submerged metal surfaces, piping and mechanical equipment which shall be in contact with water.

3.10.1.2 Primer: 1 coat Catalyzed Epoxy Primer, Tnemec S-66-1211 Epoxoline applied to a dry film thickness of 3.0 to 5.0 mils.

3.10.1.3 Finish: 2 coats Catalyzed Epoxy Polyamide Coating, Tnemec Series 66, Hi-Build Epoxoline, applied to a dry film thickness of 3 to 5 mils per coat. Minimum system dry film thickness 10 mils.

3.10.2 Non-submerged Metal

3.10.2.1 Primer: 1 coat Catalyzed Epoxy Primer, Tnemec S-66-1211 Epoxoline, applied to a dry film thickness of 3.0 to 5.0 mils.

3.10.2.2 Interior Finish: 2 coats Catalyzed Epoxy Polyamide Coating, Tnemec Series 66, Hi-Build Epoxoline, applied to a dry film thickness of 3.0 to 5.0 mils per coat. Minimum system dry film thickness 10.0 mils.

3.10.2.3 Exterior Finish: 2 coats Catalyzed Epoxy Polyamide Coating, applied to a dry film thickness of 3.0 to 5.0 mils per coat, third coat of acrylic polyurethane enamel, Tnemec Series 74 Endura Shield, applied to a dry film thickness of 2 mils minimum system thickness 12 mils.

3.10.3 Ferrous Metal Encased in Concrete

3.10.3.1 Primer: 1 coat Alkyd Rust Inhibitive Metal Primer, Tnemec Series 10, applied to a dry film thickness of 2.0 mils.

3.10.4 Concrete & Masonry Below Grade Exposed to Backfill

3.10.4.1 Primer: None

3.10.4.2 Finish: 1 coat W.R. Meadows Sealtight Solvent Type Semi-Mastic, Damproofing or equal. Apply one coat 1/16" thick.

3.11 ELECTRICAL WORK

3.11.1 It shall be noted by the CONTRACTOR that certain major items of electrical equipment such as panelboard, switchgear, control centers, transformers, and similar equipment shall be furnished with factory finish. Field painting will not be required for such items except when finish is damaged by handling, weather or installation. Then the damaged portions shall be field-primed and finished with one finish coat, with primer and finish being of the same type and color paint as originally used in the factory application. All such repainting shall be performed using the same methods as used by the manufacturer of the equipment. Damaged portions shall be refinished to give a uniform color and texture.

3.11.2 All electrical items in finished or painted area which do not have a factory finish, such as pull boxes, junction boxes, terminal boxes, conduit, condulets, racks, supports and ferrous accessories, shall be painted in an identical manner to that specified for mechanical items, for the various locations and exposures, that is, interior, exterior, submerged, etc. Unless otherwise directed by the Owner's Representative, electrical items, where exposed in the Valve Vaults, Chlorination facilities, Pumping Stations and Maintenance Buildings, shall be furnished in the same color as adjacent walls and ceilings.

3.12 PIPING COLOR CODE TABLE

3.12.1 Pipe colors should be different based on pipe service and should match existing pipe colors at the Ceresville Sewage Treatment Plant.

3.13 STENCILING

3.13.1 Equipment and informational identification shall be paint stenciled, stymie bold upper case, on the surface of the equipment. All lettering shall be

black paint with specified coatings except that black surfaces shall be white lettering. Two inch lettering shall be utilized to identify all equipment such as "Pump #1," "Pump #2," "Pump #3" and shall include all equipment as directed by the Owner's Representative. All equipment bearing a name plate as specified elsewhere shall not be stenciled.

3.14 PIPE LABELS

3.14.1 Piping shall be labeled via markers designed to withstand harsh chemicals and weather all environments. Printed legends of the labels shall be laminated between two layers of polyester. Labels shall coil around the pipe and be secured in place by an overlapping adhesive strip. Labels for piping 8-inches and larger shall be constructed with two layers of polyester that are laminated to a heat and chemical resistant carrier that is applied to the pipe with stainless steel strapping. A strapping tool shall be provided and implemented for such application.

3.14.2 Labels shall be applied to piping in an orientation appropriate for the direction of flow. Arrows shall be included on pipe labels to facilitate such application.

3.14.3 Labels for piping 1/2-inch to 1 ½-inch shall be Style 4A, labels for piping 1-inch to 2 3/8-inch shall be Style 4B, labels for piping 2 ½-inch to 4 ¾-inch shall be Style 4E, labels for piping 5-inches to 7 7/8-inches shall be Style 4F, labels for piping 8-inches to 10-inches shall be Style 4G, and labels for piping 10-inches and larger shall be model 4H as manufactured by Brimar, or equal.

3.14.4 Labels shall be installed every 20 feet along piping, where applicable and/or practical.

3.14.5 Provide Pipe Labels for all existing and new pipes. Include on labels: Pump No. and Suction or Discharge identification.

END OF SECTION

SECTION 11310
PUMPING EQUIPMENT

PART 1.0 GENERAL

1.1 DESCRIPTION

The CONTRACTOR shall furnish, install, test, and place into satisfactory operation all pumps, motors, and control equipment as specified herein and as shown on the Contract Drawings.

1.2 QUALITY ASSURANCE

1.2.1 Shop Test

Each pump furnished for this project shall be shop tested. The pump shall be tested with a factory test motor. The tests shall conform to the latest standards of the Hydraulic Institute. The tests shall determine efficiency, head, capacity and brake horsepower. The results shall be plotted in the form of a performance curve with efficiency, head and brake horsepower plotted as a function of capacity.

1.2.2 Field Test

Each pump shall be field tested at its design point to determine the amps drawn for each phase. Each pump shall be operated through at least two normal and two alarm cycles. Electrical control and alarm systems shall be tested to demonstrate that they operate in the manner intended. Pump start and stop, high water alarm and low water alarm, when applicable, shall be demonstrated. Pump chambers and other structures will be visually inspected by the ENGINEER for leakage. No visible leakage shall be allowed.

1.2.3. Documentation

Furnish five (5) certified copies of each shop test result.

1.3 SUBMITTALS

1.3.1 Shop Drawings

The CONTRACTOR shall furnish the OWNER, for approval, copies of detailed shop drawings showing outline and dimensions of all equipment specified herein and as shown on the Contract Drawings. Shop Drawings shall include as a minimum:

1.3.1.1 Dimension prints of all major items of equipment.

1.3.1.2 Complete installation drawings including a setting drawing showing location arrangement and sizing of all pump anchor bolts and pump support details.

1.3.1.3 Anticipated performance curves for the complete pump assembly showing the relationship between TDH and capacity, efficiency, horsepower and NPSH from shut-off head to minimum head conditions. For variable speed pumps, curves shall be provided for at least four speeds from maximum to the minimum required to

meet the specified design conditions. The curves shall also show maximum and minimum recommended pump delivery at each speed shown.

1.3.1.4 A motor data sheet for each size motor furnished. The data sheet shall show torques, guaranteed minimum efficiencies at full load, 3/4 and 1/2 load power factors, full load, locked rotor and running light amperes, temperature rises and results of dielectric tests. All values shall be from tests of previously manufactured, electrically duplicate motors. Data sheets shall be marked to indicate motor application, manufacturer, type, frame, size bearing type, lubrication medium, insulation and enclosure type.

1.3.1.5 A detailed description of the motor insulation system.

1.3.1.6 A system from the applicable manufacturer as to any limitations on the maximum or minimum motor speed, pump capacity and pump or motor reverse speed.

1.3.1.7 Piping and electrical schematics and layout drawings shall be JIC standard and shall show all connections required to external equipment. A bill of material and a detailed description of operation shall also be submitted for approval.

If for the equipment proposed by the CONTRACTOR, any structure changes are required, the CONTRACTOR shall prepare and submit for approval, complete drawings showing all necessary changes and all such changes shall be made at the CONTRACTOR's expense.

1.3.2 Material List

Accompanying the Shop Drawings, the CONTRACTOR shall submit an equal number of copies of a complete list of all materials and equipment proposed to the furnished and installed under this Division, giving Manufacturer's name, catalog number and catalog cut for each item, where applicable.

1.3.3 Manufacturer's Recommendations

Accompanying the Materials List, the CONTRACTOR shall submit copies of the Manufacturer's current recommended method of installation.

1.3.4 Other Submittals

Complete bound operation and maintenance manuals shall be furnished and shall include, but are NOT limited to: operating and maintenance instructions, lubrication schedule, nameplate data, parts lists and diagrams, engineering information, catalog data, name address and phone number of local authorized service representative, calibration data and other miscellaneous materials as may be necessary to provide a complete record of the overall installation. The bound operation and maintenance manuals shall be furnished in accordance with Section 01300 of the Standard Specifications.

1.3.5 Manufacturer’s Certification of Proper Installation

As part of the awarded bid, the Contractor shall arrange for the manufacturer or the manufacturer's representative to come to the site, review the equipment installation, and provide written certification that the equipment has been installed in accordance with the manufacturer's recommendations including tolerances. Review of the equipment installation shall be in the presence of all of the following: manufacturer's representative, OWNER (or OWNER's representative), and the Contractor. Certification shall be submitted to the Engineer for review. After the certifications have been approved, they shall be incorporated into the O&M manual for that piece of equipment.

1.4 GUARANTEES

The CONTRACTOR shall guarantee that the equipment furnished, including all accessories and appurtenances is of the correct design, capacity and construction to operate satisfactorily in the installation and type of service for which it is to be used.

Upon given written notice of a defect by the OWNER as soon as the defect becomes apparent, the CONTRACTOR shall replace at his own expense all defective parts within a period of (1) year from the date of substantial completion.

PART 2.0 PRODUCTS

2.1 PUMPS

2.1.1 General

Under this section, the CONTRACTOR shall furnish, install, test and place into satisfactory operation, the following pumps:

2.1.3.1 Three (3) high flow pumps in the East Boyer Run Pump Station.

2.1.3.2 Two (2) low flow pumps in the West Boyer Run Pump Station.

All pumps in each category shall be the product of one manufacturer.

2.1.2 Pump Design

2.1.3.1 The heavy duty dry-pit submersible wastewater pump(s) shall be capable of handling unscreened storm water, and other similar solids-laden fluids without clogging. The pump shall be driven by a Premium Efficiency motor, providing the highest levels of operational reliability and energy efficiency.

2.1.3 Base Assembly

2.1.3.1 In a dry pit installation, the pump shall be secured to a steel support stand of suitable strength to support the weight of the pump and resist any expected torsion, bending, or vibration forces. The pump shall be suitable for either vertical or horizontal dry pit installation without requiring any internal modifications.

2.1.4 Anchor Bolts

2.1.3.1 All anchor bolts, nuts, washers, cap screws and inserts shall be 316 stainless steel of the size recommended by the equipment manufacturer. They shall be installed in accordance with the equipment manufacturer's approved drawings.

2.1.5 Pumping Conditions

Pumps shall be designed for conditions as follows:

2.1.3.2 Three (3) high flow pumps to be installed in the East Boyer Run Pump Station.

Liquid pumped – Storm Water

Number of pumps - 3

Configuration – dry-pit submersible

Flow at Design Point, GPM – 2,600

TDH at Design Point, ft – 80

Min. discharge size - 8 inch

Maximum pump motor HP – 84

Motor speed (RPM) – 1800

Electrical – 3 Phase, 460 Volts

The pump shall be defined by the following points of its operating curve:

1	800 GPM
	132 ft TDH
2	2600 GPM
	80 ft TDH
3	4000 GPM
	45 ft TDH

2.1.3.3 Two (2) low flow pumps to be installed in the West Boyer Run Pump Station.

Liquid pumped – Storm Water

Number of pumps – 2

Configuration – dry-pit submersible

Flow at Design Point, GPM – 150

TDH at Design Point, ft – 63

Minimum discharge size – 4 inch

Maximum pump motor HP – 10

Motor speed (RPM) – 1800

Electrical – 3 Phase, 460 Volts

The pump shall be defined by the following points of its operating curve:

1 100 GPM
65 ft TDH

2 150 GPM
62 ft TDH

3 600 GPM
39 ft TDH

2.1.3.4

2.1.4 Electrical Equipment

Electrical equipment and materials shall be new, listed by UL, and bear the UL label where UL requirements apply. Equipment and materials shall be of industrial grade and of standard construction.

2.2 PUMPS FOR EAST BOYER RUN PUMP STATION.

2.2.1 General

2.2.1.1 Work under this section includes, but is not limited to, furnishing and installing a factory built pumps as indicated on the contract drawings, herein specified, as necessary for proper and complete performance.

2.2.1.2 The Contractor shall satisfy as a minimum the following pumps schedule:

Pump Type	Qty.	Discharge opening, in.	HP	Designed Flow, GPM	TDH, ft
High Flow Pump	3	8	84	2,600	80

2.2.2 Pump Construction

2.2.2.1 Major pump components shall be of gray cast iron, EN-GJL-250 (ASTM A-48, Class 35B) with smooth surfaces devoid of porosity or other irregularities. All exposed fasteners shall be stainless steel 1.4401 (AISI type 316) construction. All metal surfaces coming into contact with the pumped media (other than the stainless steel components) shall be protected by a factory applied spray coating of zinc phosphate primer followed by a high solids two part epoxy paint finish on the exterior of the pump. The pump shall be equipped with an open lifting hoop suitable for attachment

of standard chain fittings, or for hooking from the wet well surface. The hoop shall be stainless steel 1.4401 (AISI 316), and shall be rated to lift a minimum of four times the pump weight.

2.2.2.2 Sealing design for the pump/motor assembly shall incorporate machined surfaces fitted with Nitrile (Buna-N) rubber O-rings. Sealing will be the result of controlled compression of rubber O-rings in two planes of the sealing interface. Housing interfaces shall meet with metal to metal contact between machined surfaces, and sealing shall be accomplished without requiring a specific torque on the securing fasteners.

2.2.3 High Flow Pump Impeller

2.2.3.1 The impeller shall be of gray cast iron, EN-GJL-250 (ASTM A-48, Class 35B). The impeller shall be of the double shrouded, non-clogging, two vane design, meeting the Ten State Standards requirement for minimum solids passage size of 3 inches. The impeller shall be capable of passing a minimum of 3.5x4.9 inch oblong solids. The impeller shall have a slip fit onto the motor shaft and drive key, and shall be securely fastened to the shaft by a stainless steel bolt which is mechanically prevented from loosening by a positively engaged ratcheting washer assembly. The head of the impeller bolt shall be effectively recessed within the impeller bore or supporting washer to prevent disruption of the flow stream and loss of hydraulic efficiency. The impeller shall be dynamically balanced to the ISO 10816 standard to provide smooth vibration free operation..

2.2.4 High Flow Pump Wear Ring System

2.2.4.1 A replaceable wear ring of cast iron EN-GJL-300 (ASTM A48, Class 40) shall be securely fitted into the pump casing (volute).

2.2.5 High Flow Pump Volute

2.2.5.1 The pump volute shall be single piece gray cast iron, EN-GJL-250 (ASTM A-48, Class 35B) non-concentric design with centerline discharge. Passages shall be smooth and large enough to pass any solids which may enter the impeller. Discharge size shall be as specified on the pump performance curve. The discharge flange design shall permit attachment to standard ANSI or metric flanges/appurtenances. The discharge flange shall be drilled to accept both 8 inch ANSI class 125 and metric DN200 (PN 10) metric flanged fittings. Proprietary or non standard flange dimensions shall not be considered acceptable. The suction flange shall be integrated into the volute and its bolt holes shall be

drilled and threaded to accept standard 8 inch ANSI class 125 flanged fittings. The minimum working pressure of the volute and pump assembly shall be 10 bar (145 psi).

2.2.6 Premium Efficiency Motor

2.2.6.1 The Premium Efficiency motor shall meet efficiency standards in accordance with IEC 60034-30, level IE3 and NEMA Premium*. Motor rating tests shall be conducted in accordance with IEC 60034-2-1 requirements and shall be certified accurate and correct by a third party certifying agency. A certificate shall be available upon request. [*IE3 and NEMA Premium efficiency levels are equivalent, however the NEMA Premium standard is intended to cover dry installed motors only, not integrated submersible motors.]

2.2.6.2 The Premium Efficiency motor shall be housed in a water tight gray cast iron, EN-GJL-250 (ASTM A-48, Class 35B) enclosure capable of continuous submerged operation underwater to a depth of 20 meters (65 feet), and shall have an IP68 protection rating. The motor shall be of the squirrel-cage induction design, NEMA type B, Premium Efficiency. The copper stator windings shall be insulated with moisture resistant Class H insulation materials, rated for 180^{o}C (356^{o}F). The stator shall be press fitted into the stator housing. The use of bolts, pins or other fastening devices requiring penetration of the stator housing is unacceptable. The rotor bars and short circuit rings shall be made of cast aluminum.

2.2.6.3 The motor shall be designed for continuous duty. The maximum continuous temperature of the pumped liquid shall be 40^{o}C (104^{o}F), and intermittently up to 50^{o}C (122^{o}F). The motor shall be capable of handling up to 15 evenly spaced starts per hour without overheating. The service factor (as defined by the NEMA MG1 standard) shall be 1.3. The motor shall have a voltage tolerance of +/- 10% from nominal, and a phase to phase voltage imbalance tolerance of 1%. The motor shall be FM and CSA approved for use in NEC Class I, Division I, Groups C & D hazardous locations. The surface temperature rating shall be T3C. The motor shall meet the requirements of NEMA MG1 Part 30 and 31 for operation on PWM type Variable Frequency Drives.

2.2.6.4 Cooling System

2.2.6.4.1 The factory installed closed loop cooling system shall be adequately designed to allow the motor to run continuously under full load while in an unsubmerged or minimally submerged condition. A cooling jacket shall surround the stator housing, and an environmentally safe non-toxic propylene glycol solution shall be circulated

through the jacket by a circulating impeller attached to the main motor shaft. The coolant shall be pumped through an integrated heat exchanger in the base of the motor whenever the motor is running, allowing excess heat to be transferred to the process liquid.

2.2.6.5 Thermal Protection

2.2.6.5.1 Each phase of the motor shall contain a normally closed bi-metallic temperature monitor switch imbedded in the motor windings. These thermal switches shall be connected in series and set to open at 140^{o}C +/- 5^{o}C (284^{o}F). They shall be connected to the control panel to provide a high stator temperature shutdown signal, and are used in conjunction with external motor overload protection.

2.2.6.6 Mechanical Seals

2.2.6.6.1 Each pump shall be equipped with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. The seals shall operate in a lubricant reservoir that hydro-dynamically lubricates the lapped seal faces at a constant rate. The mechanical seals shall be of non proprietary design, and shall be manufactured by a major independent manufacturer specializing in the design and manufacture of mechanical seals. The lower, primary seal unit, located between the pump and the lubricant chamber, shall contain one stationary industrial duty silicon-carbide seal ring and one rotating industrial duty silicon-carbide seal ring. The stationary ring of the primary seal shall be installed in a seal holding plate of gray cast iron EN-GJL-250 (ASTM A-48, Class 35B). The seal holding plate shall be equipped with swirl disruption ribs to prevent abrasive material from prematurely wearing the seal plate. The upper, secondary seal unit, located between the lubricant chamber and motor housing, shall contain one stationary industrial duty silicon-carbide seal ring, and one rotating one rotating industrial duty silicon-carbide seal ring. Each seal interface shall be held in contact by its own spring system. The seals shall not require routine maintenance, or adjustment, and shall not be dependent on the direction of rotation for proper sealing. Each pump shall be provided with a lubricant chamber for the shaft sealing system which shall provide superior heat transfer and maximum seal cooling. The lubricant chamber shall be designed to prevent overfilling, and to provide lubricant expansion capacity. The drain and

inspection plug shall have a positive anti-leak seal, and shall be easily accessible from the outside of the pump. The seal system shall not rely upon the pumped media for lubrication and shall not be damaged when the pump is run dry. Lubricant in the chamber shall be environmentally safe non toxic material.

2.2.6.7 Mechanical Seal Protection System

2.2.6.7.1 The primary mechanical seal shall be protected from interference by particles in the water, including fibrous materials, by an active Seal Protection System integrated into the impeller. The back side of the impeller shall be equipped with a sinusoidal cutting ring, forming a close clearance cutting system with the lower submersible motor housing or seal plate. This sinusoidal cutting ring shall spin with the pump impeller providing a minimum of 75 shearing actions per pump revolution. Large particles or fibrous material which attempt to lodge behind the impeller, or wrap around the mechanical seal shall be effectively sheared by the active cutting system into particles small enough the prevent interference with the mechanical seal. The Seal Protection System shall operate whenever the pump operates, and shall not require adjustment or maintenance in order to function.

2.2.6.8 Seal Failure Early Warning System

2.2.6.8.1 The integrity of the mechanical seal system shall be continuously monitored during pump operation and standby time. An electrical probe shall be provided in a sensing chamber positioned above the mechanical seals for detecting the presence of water contamination within the chamber. The sensing chamber shall be air filled, and shall have a drain / inspection plug with a positive anti-leak seal which is easily accessible from the outside of the pump. A solid-state relay mounted in the pump control panel or in a separate enclosure shall send a low voltage, low amperage signal to the probe, continuously monitoring the conductivity of the liquid in the sensing chamber. If sufficient water enters the sensing chamber through the mechanical seal system, the probe shall sense the increase in conductivity and signal the solid state relay in the control panel. The relay shall then energize a warning light on the control panel, or optionally, cause the pump shut down. This system shall provide an early warning of mechanical seal leakage, thereby preventing damage to the submersible pump, and allowing scheduled rather than emergency

maintenance.

2.2.6.9 Shaft

2.2.6.9.1 The pump shaft and motor shaft shall be an integral, one piece unit adequately designed to meet the maximum torque required at any normal start-up condition or operating point in the system. The shaft shall have a full shutoff head design safety factor of 1.7, and the maximum shaft deflection shall not exceed .05 mm (.002 inch) at the lower seal during normal pump operation. Each shaft shall be stainless steel 1.4021 (AISI 420) material, and shall have a polished finish with accurately machined shoulders to accommodate bearings, seals and impeller. Carbon steel, chrome plated, or multi piece welded shafts shall not be considered adequate or equal.

2.2.6.10 Bearings

2.2.6.10.1 Each pump shaft shall rotate on high quality permanently lubricated, greased bearings. The upper bearing shall be a deep grooved ball bearing and the lower bearings shall be a heavy duty double row angular contact ball bearing. Bearings shall be of sufficient size and properly spaced to transfer all radial and axial loads to the pump housing and minimize shaft deflection. L-10 bearing life shall be a minimum of 100,000 hours at flows ranging from ½ of BEP flow to 1½ times BEP flow (BEP is best efficiency point). The bearings shall be manufactured by a major internationally known manufacturer of high quality bearings, and shall be stamped with the manufacturer's name and size designation on the race.

2.2.6.11 Power Cable

2.2.6.11.1 The power cables shall be sized according to NEC and CSA standards and shall be of sufficient length to reach the junction box without requiring splices. The outer jacket of the cable shall be oil and water resistant, and shall be capable of continuous submerged operation underwater to a depth of 65 feet.

2.2.6.12 Cable Entry/Junction Chamber

2.2.6.12.1 The cable entry design shall not require a specific torque to insure a watertight seal. The cable entry shall consist of cylindrical elastomer grommets, flanked by stainless steel washers. A cable cap incorporating a strain relief

and bend radius limiter shall mount to the cable entry boss, compressing the grommet ID to the cable while the grommet OD seals against the bore of the cable entry.

2.2.6.12.2 The junction chamber shall be isolated and sealed from the motor by means of sealing glands. Electrical connections between the power cables and motor leads shall be made via a compression or post type terminal board, allowing for easy disconnection and maintenance.

2.3 PUMPS FOR WEST BOYER RUN PUMP STATION.

2.3.1 General

2.3.1.1 Work under this section includes, but is not limited to, furnishing and installing a factory built pumps as indicated on the contract drawings, herein specified, as necessary for proper and complete performance.

2.3.1.2 The Contractor shall satisfy as a minimum the following pumps schedule:

Pump Type	Qty.	Discharge opening, in.	HP	Designed Flow, GPM	TDH, ft
Low Flow Pump	2	4	10	150	63

2.3.2 PUMP CONSTRUCTION

2.3.2.1 Major pump components shall be of gray cast iron, EN-GJL-250 (ASTM A-48, Class 35B) with smooth surfaces devoid of porosity or other irregularities. All exposed fasteners shall be stainless steel 1.4401 (AISI type 316) construction. All metal surfaces coming into contact with the pumped media (other than the stainless steel components) shall be protected by a factory applied spray coating of zinc phosphate primer followed by a high solids two part epoxy paint finish on the exterior of the pump. The pump shall be equipped with an open lifting hoop suitable for attachment of standard chain fittings, or for hooking from the wet well surface. The hoop shall be stainless steel 1.4401 (AISI 316), and shall be rated to lift a minimum of four times the pump weight.

2.3.2.2 Sealing design for the pump/motor assembly shall incorporate machined surfaces fitted with Nitrile (Buna-N) rubber O-rings. Sealing will be the result of controlled compression of rubber O-rings in two planes of the sealing interface. Housing interfaces shall meet with metal to metal contact between machined surfaces, and sealing shall be accomplished without requiring a specific torque on the securing fasteners.

2.3.3 Low Flow Pump Impeller

2.3.3.1 The impeller shall be of gray cast iron, EN-GJL-250 (ASTM A-48, Class 35B). The impeller shall be of the semi-open, non-clogging, single vane design, meeting the Ten State Standards requirement for minimum solids passage size of 3 inches. The impeller shall be capable of passing a minimum of 3.1 inch diameter spherical solids. The impeller shall have a slip fit onto the motor shaft and drive key, and shall be securely fastened to the shaft by a stainless steel bolt which is mechanically prevented from loosening by a positively engaged ratcheting washer assembly. The head of the impeller bolt shall be effectively recessed within the impeller bore to prevent disruption of the flow stream and loss of hydraulic efficiency. The impeller shall be dynamically balanced to the ISO 10816 standard to provide smooth vibration free operation.

2.3.4 Low Flow Pump Self Cleaning Wear Plate

2.3.4.1 The wear plate shall be constructed from gray cast iron, EN-GJL-250 (ASTM A-48, Class 35B). The wear plate shall be designed with an inlet incorporating strategically placed cutting grooves and an outward spiral V-shaped groove on the side facing the impeller, to shred and force stringy solids outward from the impeller and through the pump discharge. The wear plate shall be mounted to the volute with three stainless steel securing screws and three stainless steel adjusting screws to permit close tolerance adjustment between the wear plate and impeller for maximum pump efficiency. The wear plate shall be factory mounted to the volute in a fixed position with metal to metal contact on machined surfaces to insure optimal clearance and efficiency at startup. Future adjustments shall be easily accomplished by removing three securing screws and rotating the plate 45 degrees to the adjustment position. Adjustment to allow for wear and restore peak pumping performance shall then be accomplished using standard tools, and without requiring disassembly of the pump. The suction flange shall be integrated into the wear plate and its bolt holes shall be drilled and threaded to accept standard 4 inch ANSI class 125 flanged fittings.

2.3.5 Low Flow Pump Volute

2.3.5.1 The pump volute shall be single piece gray cast iron, EN-GJL-250 (ASTM A-48, Class 35B) non-concentric design with centerline discharge. Passages shall be smooth and large enough to pass any solids which may enter the impeller. Discharge size shall be as specified on the pump performance curve. The discharge flange design shall permit attachment to standard ANSI or metric flanges/appurtenances. The discharge flange shall be slotted to accept both 4 inch ANSI class 125 and metric DN100 (PN 10)

metric flanged fittings. Proprietary or non standard flange dimensions shall not be considered acceptable. The minimum working pressure of the volute and pump assembly shall be 10 bar (145 psi).

2.3.6 Premium Efficiency Motor

2.3.6.1 The Premium Efficiency motor shall meet efficiency standards in accordance with IEC 60034-30, level IE3 and NEMA Premium*. Motor rating tests shall be conducted in accordance with IEC 60034-2-1 requirements and shall be certified accurate and correct by a third party certifying agency. A certificate shall be available upon request. [*IE3 and NEMA Premium efficiency levels are equivalent, however the NEMA Premium standard is intended to cover dry installed motors only, not integrated submersible motors.]

2.3.6.2 The Premium Efficiency motor shall be housed in a water tight gray cast iron, EN-GJL-250 (ASTM A-48, Class 35B) enclosure capable of continuous submerged operation underwater to a depth of 20 meters (65 feet), and shall have an IP68 protection rating. The motor shall be of the squirrel-cage induction design, NEMA type B, Premium Efficiency. The copper stator windings shall be insulated with moisture resistant Class H insulation materials, rated for 180^{o}C (356^{o}F). The stator shall be press fitted into the stator housing. The use of bolts, pins or other fastening devices requiring penetration of the stator housing is unacceptable. The rotor bars and short circuit rings shall be made of cast aluminum.

2.3.6.3 The motor shall be designed for continuous duty. The maximum continuous temperature of the pumped liquid shall be 40^{o}C (104^{o}F), and intermittently up to 50^{o}C (122^{o}F). The motor shall be capable of handling up to 15 evenly spaced starts per hour without overheating. The service factor (as defined by the NEMA MG1 standard) shall be 1.3 in wet pit service and 1.15 in dry pit service. The motor shall have a voltage tolerance of +/- 10% from nominal, and a phase to phase voltage imbalance tolerance of 1%. The motor shall be FM and CSA approved for use in NEC Class I, Division I, Groups C & D hazardous locations. The surface temperature rating shall be T3C. The motor shall meet the requirements of NEMA MG1 Part 30 and 31 for operation on PWM type Variable Frequency Drives.

2.3.6.4 Low Flow Pump Thermal Protection

2.3.6.4.1 Each phase of the motor shall contain a normally closed bi-metallic temperature monitor switch imbedded in the motor windings. These thermal switches shall be connected in series and set to open at 140^{o}C +/- 5^{o}C (284^{o}F). They shall be connected to the control panel,

and used in conjunction with, and supplemental to, external motor overload protection.

2.3.6.5 High Flow Pump Thermal Protection

2.3.6.5.1 Each phase of the motor shall contain a normally closed bi-metallic temperature monitor switch imbedded in the motor windings. These thermal switches shall be connected in series and set to open at 140^{o}C +/- 5^{o}C (284^{o}F). They shall be connected to the control panel to provide a high stator temperature shutdown signal, and are used in conjunction with external motor overload protection.

2.3.6.6 Mechanical Seals

2.3.6.6.1 Each pump shall be equipped with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. The seals shall operate in a lubricant reservoir that hydro-dynamically lubricates the lapped seal faces at a constant rate. The lower, primary seal unit, located between the pump and the lubricant chamber, shall contain one stationary industrial duty silicon-carbide seal ring and one rotating industrial duty silicon-carbide seal ring. The stationary ring of the primary seal shall be installed in a seal holding plate of gray cast iron EN-GJL-250 (ASTM A-48, Class 35B). The seal holding plate shall be equipped with swirl disruption ribs to prevent abrasive material from prematurely wearing the seal plate. The upper, secondary seal unit, located between the lubricant chamber and motor housing, shall contain one stationary industrial duty silicon-carbide seal ring, and one rotating one rotating industrial duty silicon-carbide seal ring. Each seal interface shall be held in contact by its own spring system. The seals shall not require routine maintenance, or adjustment, and shall not be dependent on the direction of rotation for proper sealing. Each pump shall be provided with a lubricant chamber for the shaft sealing system which shall provide superior heat transfer and maximum seal cooling. The lubricant chamber shall be designed to prevent overfilling, and to provide lubricant expansion capacity. The drain and inspection plug shall have a positive anti-leak seal, and shall be easily accessible from the outside of the pump. The seal system shall not rely upon the pumped media for lubrication and shall not be damaged when the pump is run dry. Lubricant in the chamber shall be environmentally safe non toxic material.

2.3.6.7 Cooling System

2.3.6.7.1 The factory installed closed loop cooling system shall be adequately designed to allow the motor to run continuously under full load while in an unsubmerged or minimally submerged condition. A cooling jacket shall surround the stator housing, and an environmentally safe non-toxic propylene glycol solution shall be circulated through the jacket by an axial flow circulating impeller attached to the main motor shaft. The coolant shall be pumped through an integrated heat exchanger in the base of the motor whenever the motor is running, allowing excess heat to be transferred to the process liquid. Cooling systems that circulate the pumped medium through the cooling jacket, or those that use a toxic cooling liquid shall not be acceptable. The use of external heat exchangers, fans, or the supply of supplemental cooling liquid shall not be required.

2.3.6.8 Mechanical Seal Protection System

2.3.6.8.1 The primary mechanical seal shall be protected from interference by particles in the water, including fibrous materials, by an active Seal Protection System integrated into the impeller. The back side of the impeller shall be equipped with a sinusoidal cutting ring, forming a close clearance cutting system with the lower submersible motor housing or seal plate. This sinusoidal cutting ring shall spin with the pump impeller providing a minimum of 75 shearing actions per pump revolution. Large particles or fibrous material which attempt to lodge behind the impeller, or wrap around the mechanical seal shall be effectively sheared by the active cutting system into particles small enough the prevent interference with the mechanical seal. The Seal Protection System shall operate whenever the pump operates, and shall not require adjustment or maintenance in order to function.

2.3.6.9 Seal Failure Early Warning System

2.3.6.9.1 The integrity of the mechanical seal system shall be continuously monitored during pump operation and standby time. An electrical probe shall be provided in a sensing chamber positioned between the primary and secondary mechanical seals for detecting the presence of water contamination within the chamber. The sensing chamber shall be filled with environmentally safe non toxic oil. A solid-state relay mounted in the pump control

panel or in a separate enclosure shall send a low voltage, low amperage signal to the probe, continuously monitoring the conductivity of the liquid in the sensing chamber. If sufficient water enters the sensing chamber through the primary mechanical seal, the probe shall sense the increase in conductivity and signal the solid state relay in the control panel. The relay shall then energize a warning light on the control panel, or optionally, cause the pump shut down. This system shall provide an early warning of mechanical seal leakage, thereby preventing damage to the submersible pump, and allowing scheduled rather than emergency maintenance.

2.3.6.10 Shaft

2.3.6.10.1 The pump shaft and motor shaft shall be an integral, one piece unit adequately designed to meet the maximum torque required at any normal start-up condition or operating point in the system. The shaft shall have a full shutoff head design safety factor of 1.7, and the maximum shaft deflection shall not exceed .05 mm (.002 inch) at the lower seal during normal pump operation. Each shaft shall be stainless steel 1.4021 (AISI 420) material, and shall have a polished finish with accurately machined shoulders to accommodate bearings, seals and impeller. Carbon steel, chrome plated, or multi piece welded shafts shall not be considered adequate or equal.

2.3.6.11 Bearings

2.3.6.11.1 Each pump shaft shall rotate on high quality permanently lubricated, greased bearings. The upper bearing shall be a deep grooved ball bearing and the lower bearings shall be a heavy duty double row angular contact ball bearing. Bearings shall be of sufficient size and properly spaced to transfer all radial and axial loads to the pump housing and minimize shaft deflection. L-10 bearing life shall be a minimum of 50,000 hours at flows ranging from ½ of BEP flow to 1½ times BEP flow (BEP is best efficiency point). The bearings shall be manufactured by a major internationally known manufacturer of high quality bearings, and shall be stamped with the manufacturer's name and size designation on the race.

2.3.6.12 Power Cable

2.3.6.12.1 The power cables shall be sized according to NEC and

CSA standards and shall be of sufficient length to reach the junction box without requiring splices. The outer jacket of the cable shall be oil and water resistant, and shall be capable of continuous submerged operation underwater to a depth of 65 feet.

2.3.6.13 Low Flow Pump Cable Entry System

2.3.6.13.1 The cable entry system shall consist of submersible plug assembly which allows the cable be easily disconnected from the pump for service or replacement. Cable sealing shall be accomplished by a Nitrile compression grommet with both cylindrical and conical sealing surfaces, flanked by a stainless steel washer and an integrated strain relief. A brass (C3604) compression nut shall be threaded into to the cast iron EN-GJL-250 (ASTM A-48, Class 35B) cable plug housing, compressing the grommet ID to the cable while the grommet OD seals against the bore of the cable entry housing. Cable conductors shall be terminated in copper pin connectors which are separated and retained by a circular pin retainer fabricated from high dielectric strength Polyamid (30% GF). Each pin shall pass through its own hole in the pin retainer, maintaining perfect alignment with the mating pins in the motor body. The corresponding motor body pin assembly shall be manufactured from high dielectric strength Polyamid (30% GF), with copper connector pins. The pin assembly shall be sealed with an o-ring to prevent water entry into the motor, and retained in the motor housing bore via a retaining ring. Attachment of the plug assembly to the motor shall engage the corresponding copper pins, creating a complete circuit between the motor and cable. The plug assembly shall be fastened with stainless steel fasteners, and shall be sealed by an o-ring.

2.3.6.13.2 The cable plug and sealed entry system as part of the motor shall be FM and CSA approved for use in NEC Class I, Division I, Groups C & D hazardous locations. The system shall be anti wicking by design, and shall prevent any water that enters the cable through damage to the jacket from entering the motor.

2.7 ACCEPTABLE PRODUCTS

Pump Location	Manufacturer	Model

East Boyer Run Pump Station - High Flow	Sulzer ABS Pumps, Switzerland	XFP 200J-CH2-PE 630/4
West Boyer Run Pump Station - Low Flow	Sulzer ABS Pumps, Switzerland	XPF 100E-CB1-PE 75/4

2.8 OTHER MATERIALS

All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds and subject to approval of the Owner and the Engineer.

PART 3.0 EXECUTION

3.1 INSTALLATION

Installation of all equipment shall be in strict accordance with the Manufacturer's recommendations as approved by the Engineer. Furnish services of the Manufacturer's technical representative to supervise the initial phase of setting and aligning of the equipment, and after the installation is completed, for startup, testing and to instruct the Engineer in proper maintenance.

Upon completion of the work, and prior to its acceptance by the Engineer, make all required field tests to ensure proper operation under "normal" and "alarm" activating conditions.

3.2 OPERATING AND MAINTENANCE MANUALS

Installation of the pump chamber shall be done in accordance with the written instructions provided by the manufacturer.

Operation and maintenance manuals shall be furnished which will include parts lists of components and complete service procedures and troubleshooting guide. Operation and maintenance manuals shall meet the requirements of Section 01200.

3.3 PUMP START-UP

3.3.1 The Contractor shall provide the services of a factory-trained representative for a minimum period of one day on-site to perform initial start-up for each pair of pumps and to instruct the owner's operating personnel in the operation and maintenance of the equipment.

3.4 GUARANTEE

The CONTRACTOR shall guarantee all pumps for one year from date of conditional acceptance.

END OF SECTION

SECTION 15060
MECHANICAL PIPING & ACCESSORIES

PART 1.0 GENERAL

1.1. DESCRIPTION

1.1.1. Description

This Section covers all piping, valves and specials as shown on the contract drawings and specified herein. This Section covers all piping for raw sewage inside and within 5 feet of structures. Furnish all materials, tools and equipment, and install complete piping. Materials shall include, but not necessarily limited to all pipe, valves and accessories, fittings, specials, couplings, jointing and gasketing materials, harness adapters, metal pipe hangers and supports, and miscellaneous other accessories and coatings as specified herein.

1.2. QUALITY ASSURANCE

1.2.1. Piping

1.2.1.1. The finished pipe shall be pressure tested at a pressure of 100 pounds per square inch (psi) for 2 hours. The pipe shall be acceptable if during the two-hour test period the initial pressure of 100 psi does not drop below 95 psi and no visible leaks are observed. Before beginning the pressure test and pressurizing the pipe, all air must be removed from the section of test pipe. Also, the pressure in the test section must be allowed to stabilize at 100 psi for at least one half hour before beginning the 2 hour test period. The test shall be conducted until no leaks are visible and pressure does not drop below 95 psi.

1.3. SUBMITTALS

1.3.1. General

Furnish complete shop drawings before delivery of any piping material to the job site. Shop drawings shall be prepared in accordance with Section 1200, Contractor's Drawings and Submittals. Pipes and fittings shown bear the same letter or number designation as marked on the pipes and fittings to be delivered to the site.

1.3.2. Material List

Accompanying the shop drawings, submit copies of a complete list of all materials proposed to be furnished and installed under this portion of the work.

1.3.3. As-Built Drawings

During the progress of the work, maintain an accurate record of the location of the piping with reference to job base lines, grades and elevations. Show all changes made in the piping installation from the layout and materials shown on the approved shop drawings.

1.4. PRODUCT HANDLING

1.4.1. Protection

Use all means necessary to protect the materials of this Section before, during and after installation and to protect the installed work and materials of all other trades.

1.4.2. Replacements

In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.

PART 2.0 PRODUCTS

2.1. PIPE AND FITTINGS

2.1.1. Interior Pipe

2.1.1.1. All interior ductile iron pipe shall meet the requirements of AWWA C115 with a working pressure of 150 psi. All interior ductile iron pipe shall have flanged joints in conformance with AWWA C115. All interior ductile iron pipe shall be double cement lined and the exterior surface furnished to be compatible with the specified paint system.

2.1.1.2. All interior fittings shall be ductile iron fittings meeting the requirements of AWWA C110. The fittings shall have flanged joints. The fittings shall be double cement lined and the exterior surface finished shall be compatible with the specified paint system.

2.1.1.3. All flanged piping and fitting joints shall be made using 1/8 inch thick, Buna-N rubber, full face gaskets with dimensions conforming to the dimensions shown on Table A.1 from Appendix A of AWWA C115.

2.1.2. Joints

2.1.2.1. Unless otherwise specified or indicated on the Drawings, joints for exposed ductile iron pipe and fittings shall be flanged. Pipe shall have screwed-on flanges conforming to AWWA C1 15.

Fittings shall have integrally cast flanges in accordance with AWWA C1 10.

2.1.3. Mechanical Couplings

2.1.3.1. Couplings shall be provided where required to facilitate the installation or removal of valves and equipment, in addition to the couplings shown on the drawings. All couplings shall be designed for the same pressure rating as the pipes on which installed.

2.1.3.2. The pipe couplings shall be of a gasketed, sleeve-type, with diameter to properly fit the pipe. Each coupling shall consist of one (1) steel middle ring, 0.154 inches thick and 5 inches in length, two (2) steel followers, two (2) rubber-compounded wedge section gaskets and sufficient track-head steel bolts to properly compress the gaskets. Field joints shall be made with this type of coupling.

2.1.3.3. The middle ring and followers of the coupling shall be true circular sections free from irregularities, flat spots, or surface defects. They shall be formed from mill sections with the follower-ring section of such design as to provide confinement of the gasket. After welding, they shall be tested and cold expanded a minimum of 1% beyond the yield point.

2.1.3.4. The coupling bolts shall be of the elliptic-neck, track-head design with rolled threads. The manufacturer shall supply information as to the recommended torque to which the bolts shall be tightened. All bolt holes in the followers shall be oval for greater strength.

2.1.3.5. The gaskets of the coupling shall be composed of a crude or synthetic rubber base compounded with other products to produce material which will not deteriorate from age, from heat, or exposure to air under normal storage conditions. It shall also possess the quality of resilience and ability to resist cold flow of the material so that the joint will remain sealed and tight indefinitely when subjected to shock, vibration, pulsation and temperature, or other adjustments of the pipe line.

2.1.3.6. The couplings shall be assembled on the job in a manner to insure permanently tight joints under all reasonable conditions of expansion, contraction, shifting and settlement, unavoidable variations in trench gradient, etc. The coupling shall be Dresser, Style 38, as manufactured by Dresser Manufacturing Division, Bradford, Pennsylvania, or equal.

2.2 PIPE HANGERS

2.2.1 All pipe hangers shall be standard clevis hangers designed for suspending

non-insulated stationary pipe allowing for vertical adjustment. Pipe hangers shall be Underwriter's Laboratories Listed for ¾" through 12". Hangers shall comply with Federal Specification WW-H-171E & A-A-1192A Type 1 and Manufacturers Standardization Society MSS SP-69 & SP-58 Type 1.

2.2.2 Pipe hangers for metal pipe shall be manufactured with a plain, standard finish.

2.2.3 Pipe hangers for plastic pipe shall be provided with a plastic coating.

2.2.4 Pipe hangers shall be Series B3100 as manufactured by Cooper Industries, or equal.

2.3 PIPE SUPPORTS

2.3.1 Pipe supports shall be installed as located on Contract Drawings. Additionally, supports shall be provided and installed in accordance with Contract Drawing details.

2.3.2 Metal pipe supports shall be of steel flanged type, and shall be provided with a plain finish. Pipe flange supports shall be series B3094 as manufactured by Cooper Industries, or equal.

2.3.3 Vertical pipe shall be supported at base elbows. Base elbow pipe supports shall be in accordance with Contract Drawing details.

2.3.4 All other piping shall be supported by pipe saddles designed for support of horizontal pipe from floor. Saddle supports shall be manufactured of steel, and shall be provided with a Plain Standard Finish. Saddle supports shall be series B3095 as manufactured by Cooper Industries, or equal.

2.3.5 All pipe supports shall be provided with a steel Base Stand. Base Stands shall be fabricated of steel and shall be provided with a Plain Standard finish. Base Stands shall be unthreaded, and shall meet requirements of 12X anchor diameter hole spacing for seismic applications. Base Stands shall be series B3088, as manufactured by Cooper Industries, or equal.

2.4 OTHER MATERIALS

2.4.1 All other materials, not specifically described but required for a complete and proper installation of the work of this Section, shall be new; first quality of their respective kinds; and subject to approval of the ENGINEER.

PART 3.0 EXECUTION

3.1. SURFACE CONDITIONS

3.1.1. Inspection

3.1.1.1. Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence. Verify that all piping may be installed in accordance with all pertinent codes and regulations, the original design, and the referenced standards.

3.1.2. Discrepancies

3.1.2.1. In the event of discrepancy, immediately notify the ENGINEER.

3.1.2.2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.2. INSTALLATION

3.2.1. General

3.2.1.1. All All pipes and fittings shall be laid according to the lines and grades shown on the plans or as required. All piping shall be adequately supported, anchored and secured by approved piers, hangers and ties.

3.2.1.2. All pipe and castings shall be thoroughly cleaned before being lowered into the trench. The exposed ends of all uncompleted lines shall be closed with tight wooden plugs adequately secured at all times when pipe laying is not actually in progress.

3.2.2. Metal Piping

3.2.2.1. Jointing with mechanical couplings shall conform to Manufacturer's recommendations. All bolts shall be tightened in such a manner as to preserve true alignment and shall uniformly distribute the stress in the bolts. Bolt tightening shall be accomplished with torque wrenches.

3.2.2.2. Mechanical joints shall be made in strict accordance with the manufacturer's recommendations, using proper bolt torque and gaskets lubricates. All parts shall be thoroughly cleaned before assembly.

3.2.2.3. Threaded joints shall be made in strict accordance with the manufacturer's recommendations, using proper bolt torque and gaskets lubricates. All parts shall be thoroughly cleaned before assembly.

3.2.2.4. Flanged joints shall have 1/16-inch thick gaskets up to 8-inch diameter piping and for larger sizes; gasket thickness shall be 3/32 inches. The gaskets shall be of best quality one-piece cloth inserted sheet rubber. Flanges shall be firmly bolted with the machine and shall be so tightened as to uniformly distribute the stress in the bolts. The bolt length shall be such that projection beyond the nut shall not be more than 1/4 inch. No washers shall be used.

3.2.2.5. Where required for proper location of materials, valves fittings, or other castings, pipe or fittings shall be cut with approved pipe cutter. Cutting shall be carefully done by experienced men, in such a manner as to leave a smooth end normal to the axis of the pipe. When ductile iron pipe is cut in the field, cut ends shall be tapered about 1/8-inch at a 45-degree angle and all sharp edge or rough spots removed by use of a coarse file or portable grinder.

3.2.2.6. Wherever conditions will permit piping, which is to be buried, shall be tested before trenches are backfilled. All joints shall be examined during the open trench test and all visible leaks entirely stopped.

3.2.3. Taps in Piping

3.2.3.1. Taps in piping shall be made for the connection of equipment gauges, sample lines, and wherever shown on the plans or required. The taps are included under this Section and may be either in the shop or in the field. Taps shall be made to the minimum thread length required under ANSI B16.1. In cast iron or ductile iron pipe, cast bosses shall be provided should the thickness of the pipe or fittings be less than that required.

3.3. TESTING

3.3.1. Test all completed piping and furnish all necessary equipment, materials

and labor for making the tests as specified, including pumps, gauges, thrust protection, temporary bulkheads, etc.

3.3.2. Leakage at the joints shall be corrected by approved means and the piping retested in accordance with this specification until the tests are satisfactory.

3.3.3. Flanged pipe lines shall show no leakage during the test period. Leakage through mechanical push-on joints shall be within the permissible limits as specified in AWWA C-600.

END OF SECTION

SECTION 16010
GENERAL PROVISIONS

The General Conditions, any supplementary General Conditions and Division 1, General Requirements, are hereby made a part of this section as fully as if herein.

PART 1.0 GENERAL

1.1 SCOPE OF WORK

A. Purpose of this project is to relocate the existing electrical power and control systems from the existing vaults to a new above ground pad mounted motor control center.

B. This work includes all labor, materials, equipment and services for a complete electrical system. Included in this contract, but not limited to, is the following:

1. New outdoor motor control centers.

2. Furnish and install electrical connections complete to all equipment.

3. New pump station control panel to control the pumps.

4. Support systems for electrical work.

5. Cutting and patching for installation of work specified under Division 16.

6. Test of electrical systems.

7. Scada system terminal boxes upgrade and wiring.

8. New pressure transducers.

C. Under this section provide electric services for all fixtures, appliances and items of equipment requiring same and shown on any contract drawings, specified under this division, mechanical division or any other division or specifications, or specified to be furnished by Owner.

1.2 LOCAL CONDITIONS

A. Examine the site and observe the conditions under which work will be done and all other circumstances which will affect the work before submitting bid. The submittal of a bid will indicate that the Contractor has full knowledge of the problems involved in the performance of the work.

B. Verify, in the field, scale dimensions on plans.

C. Check architectural, structural, mechanical, and electrical plans to avert possible installation conflicts.

D. Prior to installation of materials and equipment, discrepancies between plans and actual field conditions or between plans and specifications shall promptly be

brought to the attention of the Engineer for a decision.

1.3 APPLICABLE CODES AND STANDARDS

A. Unless stated otherwise in the GENERAL CONDITIONS, the currently adopted codes by the enforcing authorities shall govern.

1. NFPA Codes.

2. BOCA Building Code.

3. Local codes.

4. Requirements of the Fire Marshal.

1.4 SUBMITTALS

A. All submittals shall include sufficient data to make a thorough evaluation of features, construction and performance. Submittals shall be bound in booklet form with a cover sheet indicating each item and respective manufacturer`s catalog number.

B. Materials, equipment and fixtures shall completely satisfy specification requirements and be suitable for their intended use. Items or equipment submitted shall include all accessories and options recommended by the manufacturer for satisfactory, reliable and safe operation in its designated location.

C. Where model number or name of one manufacturer is followed in specifications by one or more other manufacturer’s names, design has been based on first product named and shall be considered to be the specified product or manufacturer, named alternates may require minor deviations. Contractor shall indicate deviations in submittals/shop drawings.

D. Under base bid, furnish equipment and material specified or named alternates. Products submitted shall be equal in quality to products of the specified manufacturer and shall include the standard features of the specified product and also optional features or necessary changes specified herein. Submittal of alternates shall include all changes in building systems, piping, wiring, supports or accessories required for satisfactory and intended operation. Engineer shall be final judge of equivalence.

E. Substitute equipment submitted shall include a price change or advantage to Owner, if accepted, at time of submission. Product and performance requirements of substitute items shall be the same as named alternates.

F. Manufacturer's model and catalog numbers, which are given for convenience of identifications only, change frequently and may not necessarily include specified or required features and may not insure compatibility with supporting systems or intended application. Contractor shall insure that material and equipment delivered to job site is suitable for the intended application and indicated connections. Review of shop drawings shall not include review and verification of submitted catalog numbers or quantities required.

G. Review of and noted comments on Contractor's submitted shop drawings does not constitute a change order or a waiver of contract requirements. In the event of conflict between submittals or shop drawings and contract documents, the latter shall govern. If waiver of particular requirement is requested by Contractor a formal written request shall be made to Owner as per General Conditions.

H. When directed, Contractor shall provide samples of material or equipment, as directed.

I. Equipment shall be shipped or fabricated in sections in suitable size for entering building and all necessary arrangements for their installation shall be made by Contractor.

J. Shop drawings and submittals shall bear the General Contractor's review and approval stamp prior to submission to the Engineer.

K. Submittals shall be bound in booklet form, include a summary cover page listing manufacturer and model number and shall indicate if the submitted item is a substitute. Furnish a minimum of six (6) copies of all submittals or as required by the Engineer. At least one submission shall be a manufacturer's original product and data sheet, the remaining may be photocopies. Three (3) copies of all shop drawings and material cuts are required for equipment brochure at contract completion.

L. Within 30 days after award of contract, submit a complete list of materials to be used on project specifying manufacturer, grade, trade name, and catalog number. Materials list shall be complete. Partial list not acceptable.

M. Submit copies of shop drawings for all electrical equipment custom-made for this contract. Drawings shall be revised as directed and resubmitted.

N. Manufacturer's drawings, sketches, and instructions shall supplement but not supersede contract drawings and specifications.

O. Submittals shall show:

1. Physical size and arrangement of equipment.

2. Wiring diagrams for all equipment showing all circuit devices, conductor sizes, color coding, type, etc.

3. Elementary control diagrams in straight line form for motor control equipment showing all control devices connected in the system.

4. Specifications for all components.

1.5 MATERIALS AND ACCESSORIES

A. Materials shall be new and listed by the Underwriters Laboratories, Inc., or locally approved national testing agency as conforming to standards in every case where such a standard has been established for the particular materials in question.

B. Contractor shall be responsible for fit of equipment in available space and shall take field measurements to verify fit.

C. Equipment shall be packaged in their original containers and be limited to products regularly produced and recommended for service ratings in accordance with manufacturers' catalogs, engineering data or other comprehensive literature made available to the public, and in effect at the time of contract award and shall be turned over to the Owner free of all defects.

D. All equipment or materials for any one system shall be furnished by the same manufacturer. Such items as lamps, conduit fittings, wire, electrical switchgear, wiring devices, switchgear, etc., shall be the same throughout the project.

E. Materials installed on exterior of buildings shall be weather tight and of such design as intended for this purpose. Ferrous exterior materials, galvanized.

F. Equipment shall be installed in strict accordance with manufacturer’s instructions for type, capacity and suitability of each piece of equipment used. Use weatherproof equipment where required. Install equipment in accordance with manufacturer's recommendations and meet conditions for manufacturer's standard warranty.

G. Contractor shall effectively protect his work, materials, or equipment which are liable to injury during construction period. Openings into any part of conduit system as well as associated fixtures, equipment, both before and after being set in place must be securely covered or otherwise protected to prevent obstruction of conduit or injury due to carelessness or maliciously dropped tools or material, grit, dirt, or any foreign matter. Contractor is responsible for all damage so done until his work is installed and accepted. Conduit ends shall be covered with capped bushings.

H. Furnish reinforced concrete housekeeping pads to extend 6 inches beyond equipment for all free-standing electrical distribution equipment.

I. Provide all accessories, equipment and connections required for complete installation, ready for continuous use by Owner.

1.6 INSPECTION AND REGULATIONS

A. Do not allow or cause any of this work to be covered up or enclosed until it has been inspected, tested and approved by the authorities having jurisdiction over the work. Should any of this Contractor's work be enclosed or covered before such an inspection and test, he shall, at his own expense, uncover the work and after it has been inspected, tested and approved make all repairs with such material as may be necessary to restore all of his work and that of the other contractors to its original condition.

B. Work shall meet requirements of Owner, National Electrical Code, local regulations, and rules of the Utility Company. Equipment and materials shall bear label of approval of National Board of Fire Underwriters and be U. L. listed for their particular application.

C. Work shall meet requirements of the owner's insurer.

1.7 TESTS

A. Give timely notice of intention to test or cover up work to permit observation. Contractor shall test all wiring for continuity and grounds before connecting any equipment or outlets. Contractor shall test entire system in accordance with current procedures stated in Acceptance Testing Specifications published by the National Electric Testing Association, Inc. All equipment necessary to conduct such test shall be furnished at the Contractor's expense.

1.8 COOPERATION WITH OTHER TRADES

A. Confer with all other trades whose work might affect installation and arrange work in proper relation to that of others and with architectural finishes.

B. Where interferences occur, Contractor shall, before installing work involved, consult with Engineer and other trades to reach agreement as to exact location and level of work.

C. Contractor is responsible for arrangement of work, equipment and maintenance of proper clearances for installation. Should work installed require modification to avoid interference, such changes shall be made without additional cost.

D. If work is dependent for its proper execution on contiguous work not specified in this Division. The Contractor shall examine such work and report in writing any defects therein or conditions rendering it unsuitable. Beginning of work without making of such a report shall constitute an acceptance of such work, and any subsequent defects in his work consequent shall be of his responsibility.

1.9 FIELD MEASUREMENTS

A. Visit the site before submitting bid and check location of existing utilities, conditions, verify dimensions and locations shown on the plans and over all costs and work herein described or shown.

B. Take measurements necessary for this work and be responsible for their accuracy. Necessary pull boxes and junction boxes as required to accomplish distribution shall be provided.

1.10 STRUCTURAL DIFFICULTIES

A. Should structural difficulties prevent performing work, necessary deviations, as determined by Engineer, shall be performed.

1.11 DRAWINGS AND SPECIFICATIONS

A. Drawings shall be considered schematic in nature and shall represent a completed product. Contractor is responsible for installation of equipment and methods of achieving a satisfactory and intended installation. Locations of devices are intended to show a general arrangement and intended function. Door swings and architectural features shall be checked for final condition. Coordinate with all contract documents, Owner provided furniture or equipment

drawings, structural, architectural, and mechanical plans and specifications. Coordinate with other trades.

B. Where there exists a conflict between drawings and specifications, the Engineer shall be contacted to determine the intent. In all circumstances, the final contract document interpretation shall provide compliance with all codes.

C. Wiring devices shall be located uniformly with respect to building structure and other work. Locations shall be coordinated. Should there be any interference between electrical wiring and other trades, Contractor shall notify Engineer so that proper location may be decided upon.

1.12 PERMITS

A. All permits, licenses or incidental fees not otherwise identified under provisions of General Conditions of this contract specification shall be borne by this Contractor.

1.13 OPERATIONS AND MAINTENANCE MANUALS

A. Furnish 3 sets of Operation Manuals in loose leaf binders. The manuals shall include:

1. Descriptive brochures on all equipment.

2. Maintenance instructions.

3. Operation Instructions.

4. Parts list for all equipment.

5. Certificates for equipment as required.

6. Service phone number of installing company.

7. Table of Contents.

8. Wiring Diagrams.

1.14 "AS BUILT" DRAWINGS

A. A separate set of white background Electrical prints marked in red ink "As Built" shall be kept in good condition at the job site during progress of construction. Mark to indicate changes as they occur in the field installation of equipment.

B. Show location of equipment, conduits, etc.

C. At all times, these Drawings shall be up-to-date and available at the site for verification. Before final payment is approved, the Drawings shall be made correct and delivered to the Engineer. The correct circuit breaker numbers shall be used on the “As Builts”.

D. At the completion of the job, the contractor shall obtain the AutoCAD drawing

files from the Engineer and update file from the “as-built” drawings. The updated AutoCAD files shall also be delivered to the Engineer.

1.15 GUARANTEE

A. Unless otherwise specified, guarantee unconditionally for a guarantee period as set forth in General Conditions all materials, workmanship and installation. During this period, adjust, repair or replace at no cost to Owner any item of equipment or workmanship found to be defective.

B. Contractor shall be responsible for and pay for damages caused by or resulting from defects in workmanship.

(END OF SECTION)

SECTION 16100
BASIC MATERIALS AND METHODS

PART 1.0 GENERAL

1.1 SCOPE OF WORK

A. Requirements of this section apply to all other parts of Division 16.

PART 2.0 PRODUCTS

2.1 Raceways and fittings, minimum size 3/4 inch, except for controls, which may be ½ inch. A separate insulated grounding conductor shall be provided in all conduits and raceways.

A. EMT - Electrical Metallic tubing: Triangle PWC, Republic, or Porter, galvanized steel, enameled inside finish, UL-797, WW-C-563.

B. Galvanized rigid steel conduit: Triangle PWC, Republic or Porter, hot dipped galvanized steel, UL-6, WW-C-582D.

C. Liquid-tight flexible conduit: Sealtite, American Brass type U.A.

2.2 CONDUIT FITTINGS

A. Compression fittings, Steel: Midwest, O-Z Gedney, Steel City.

B. Set screw fittings, steel: Midwest, O-Z Gedney, Steel City.

C. Plastic insulating bushings: T & B, O-Z, Gedney, Scotch, Steel City, Raco, Appleton, Efcor, Union.

D. Metallic bushings: T & B, Gedney, Steel City, Raco, Appleton, Efcor. Use metallic bushings where bushing is exposed.

E. Flexible liquid resistant conduit fittings: Sealtite or equal.

F. Expansion Joints:

1. Conduits, rigidly secured to building construction on opposite sides of a building expansion joint, shall be provided with expansion and deflection couplings. The couplings shall be installed in accordance with the manufacturer's recommendations.

2. Expansion and deflection couplings shall also be installed where shown on the drawings.

3. The expansion/deflection couplings shall be by O-Z/Gedney or equal.

2.3 GROUND SYSTEM DEVICES AND EQUIPMENT

A. Ground bushings: O.Z. Type BL.

B. Pipe connectors: O.Z. Type ABG.

C. Enclosure connector: O.Z. Type QG or KG.

D. Feed through lug: Brundy type Q2B.

2.4 BOXES

A. Outlet, junction, switch, or manufactured pull boxes shall be one piece stamped galvanized steel, machine screw fasteners with ground bond screw, UL listed.

B. Conduit fittings shall be steel. Conduit fittings shall be by Appleton or approved equal.

C. Cast boxes, types FS and/or FD shall be of malleable iron or aluminum. Cast boxes of Feraloy ("gray metal") shall not be acceptable. Cast boxes shall be Appleton or approved equal.

D. Group surface mounted device boxes shall be in a multi-gang cast box. The size shall be governed by the intended use.

E. Exposed boxes less than eight feet above floor or on accessible finished surfaces shall not have removed and unused knockouts. Boxes with exposed knock-outs will not be accepted. Use cover plates which do not protrude beyond the box and without sharp edges. Box mounting hardware shall be concealed within the box. Boxes shall be fastened to studs where spacing permits.

2.5 CONDUCTORS

A. General:

1. Unless specifically indicated otherwise, all wiring shall be 98 percent conductivity copper conductors. Minimum wire size shall be #12 AWG. All wire AWG #8 or larger shall be stranded. Insulation shall be dual rated THWN/THHN. Manufacturers shall be Triangle, Phelps Dodge, or Royal.

B. Wire within buildings:

1. Single conductor wires: 600 volt, THWN, dual rated THWN/THHN within metallic raceways.

2. Cable Assemblies: Class 2, 3 and communications: Cable shall be provided as applicable for intended use(s). All cables may have a general use jacket. Install in raceways.

C. Exterior wiring:

1. Underground: In conduit: dual rated THWN/THHN.

2. Above grade: In conduit: Type dual rated THWN/THHN.

3. Aluminum wiring shall not be used.

D. Wire connectors:

1. Copper wire: For connections of one or more #10 AWG or smaller, solderless twist-on connectors shall be used. The connectors shall have an outer insulating shell manufactured from nylon (polyamide) material and shall be formed with "S"-shaped fins to improve the twisting action. The spring insert shall be a helical elongated coil formed from square spring steel to cause the spring to have "live action" and reduce the turning friction. The connectors shall be rated flame and heat retardant for up to 105 degrees C maximum and be Underwriter's Listed under UL 486. Connectors shall be Buchanan "B"-Caps or approved equal by Pass & Seymour, Ideal, Hyco.
2. Conductors #8 AWG and larger shall be terminated, spliced or tapped wherever practicable with T & B "Color Keyed" Series 54000, tool applied compression connectors or approved equal.

E. Wire Fastening Products:

1. Provide wire fastening products when wiring is specified or required to be secured.

2. Wire fastening products shall include but not be limited to the following types of components: natural nylon cable ties, black (UV-resistant) cable ties, cable tie mounts, adhesive cable tie mounting pads, adhesive press clips, molded nylon clamps, molded polypropylene clamps, flat nylon clamps and adhesive-mount adjustable clamps.

3. The contractor shall provide all accessories required for a complete and satisfactory installation.

4. Wire fastening products shall be by Brady or approved equal.

F. Wire Pulling Lubricants:

1. Use pulling lubricants on all raceway wiring. Pulling lubricants shall be of a greaseless compound, non-corrosive, non-conductive, non-combustible, non-toxic, for use with PVC, steel, aluminum or copper raceways and safe for use on all UL-listed wire insulation. The pulling lubricant shall be "Quick-Slip" by Buchanan or approved equal by Ideal.

G. Electrical supporting devices:

1. Materials secured to the structure by: inserts cast in concrete, expansion anchors in concrete block, machine screws or bolts on metal surfaces. Bolts and screws used on interior shall be black steel or galvanized; on exterior, brass or bronze. Cartridge driven studs used only where specifically noted or permitted by the Engineer. Hangers shall be as follows:

a. Steel channel: Kindorf, Unistrut, Globe Strut, Strut by `B-Line'.

b. Channel fittings: Kindorf, Unistrut, Globe Strut, fittings by 'B-Line'.

c. Conduit hangers: Clevis type by Unistrut, Kindorf, Grinnell.

d. Wall anchors: Expansion bolt, toggle bolt, or other approved structural anchor. Wood or fiber plugs shall not be used.

PART 3.0 EXECUTION

3.1 INSTALLATION

A. Electrical items shall be installed in locations shown on contract drawings. Contractor shall study general building plans in relation to space surrounding each device in order that intended work may accommodate all other specified work. Boxes shall be installed in a rigid and satisfactory manner. Support all boxes independent of raceways. Adjacent wall mounted wiring devices, room thermostats or other equipment shall be coordinated and so located either at the same elevation or in line, one above the other. Install conduit, outlets and equipment to clear beams or obstructions. Do not cut into or reduce the size of any load-carrying member without the approval of the Engineer. Permission of resident Engineer shall be obtained before cutting any existing structural concrete walls or floors. Check drawings and work of others to prevent interference. Deviations of work to avoid obstructions as determined by the Engineer shall be done without additional cost.

B. Wiring and conduit shall be kept at least 6 inches from parallel runs of pipes or ducts. Exposed runs of conduit or tubing shall have supports spaced not more than 6 feet apart and shall be installed with runs parallel or perpendicular to walls, structural members or intersections or vertical planes and ceilings, with right angle turns consisting of cast metal fittings and symmetrical bends.

C. Exposed wiring and conduit shall be installed in a neat and workmanlike manner with runs plumb and parallel to walls. Bends and offsets shall be avoided where possible, but where necessary shall be made with an approved hickey or conduit bending machine. Conduit or tubing which has been crushed or deformed in any way or has begun to rust shall not be installed. Use expansion bolts to secure equipment, conduit or devices. Wood or dowel plugs are not acceptable. Conduits or tubing shall be supported on approved types of galvanized wall brackets, ceiling trapeze or pipe straps, secured by means of expansion bolts in concrete or brick. Nails shall not be used as a means of fastening surface boxes or conduits. Conduit or tubing shall be installed in such a manner as to insure against trouble from collection of trapped condensation and all runs on conduit shall be arranged as to be devoid of traps wherever possible.

D. Raceways and cable shall meet requirements of the National Electrical Code and local codes.

E. Except noted or specified otherwise, wiring shall be installed as follows:

1. Outdoors Exposed: Schedule 40 GRS conduit.
2. Below Grade: Schedule 40 PVC conduit.

3. Pump Station Vault Exposed: Threaded GRS conduit.

4. Liquid-tight flexible metal conduit shall be used for connections to motors and other electrical equipment subject to movement, vibration, mis-alignment, cramped quarters or noise transmission.

F. Clamps shall be malleable iron. Multiple runs shall be supported on metal channel with conduit clamps. Trapezes shall be metal channel with conduit clamps.

G. Penetrations through concrete walls, floors and footings, both interior and exterior shall be sleeved and caulked with grout or plastic compound.

H. Handling and installation: Bends shall be kept in accordance with minimum recommended by manufacturer. Cables shall be paralleled on reels and be pulled directly into raceway from the coil or reels on which they are received. Cable shall not be laid on the ground.

I. Use pulling lubricants on all raceway wiring. Wire and cable installed only after raceways are free of obstructions and clean. All wire color coded. Wiring shall be tagged with Brady "Quick" labels at all pull boxes, junction boxes and panelboards. Wiring in panelboards and terminal cabinets shall be neatly trained and served.

3.2 GUARANTEE

A. Unless otherwise specified, guarantee unconditionally for a guarantee period as set forth in the General Conditions all materials, equipment, workmanship and installation. During this period, adjust, repair or replace at no cost to Owner any item of equipment or workmanship found to be defective.

(END OF SECTION)

SECTION 16400
SERVICE AND DISTRIBUTION

The General Conditions, any supplementary General Conditions and Division 1, General Requirements, are hereby made a part of this section as fully as if herein.

PART 1.0 GENERAL

1.1 SCOPE OF WORK

A. Work included:

1. Complete electrical distribution system.

B. Work included elsewhere: See Section 15010 - General Provisions (Mechanical), Section 16010 - General Provisions (Electrical).

1.2 SUBMITTALS

A. Submit cuts on all items of electrical equipment. Include panelboards, switches, wiring, receptacles, motor starters, disconnects, wiring devices, cover plates, distribution equipment and over current devices.

PART 2.0 PRODUCTS

2.1 EQUIPMENT

A. Disconnect Switches: Disconnect switches 30 amp through 400 amp shall be heavy duty type, Fusible, with solid neutral and shall fuse all ungrounded conductors. Unless otherwise specified, fuses at service entrance shall have 100,000 amp interrupting capacity, UL approved. Switches shall be rated as shown on contract drawings and shall be quick-make, quick-break with positive pressure fuse clips, externally operated cover, and interlocked handle with provision for padlocking in open or closed position. Enclosures shall be NEMA 1 except NEMA 3R where located outdoors or where accessible to the general public. Furnish additional locks where required. Switches shall be Square D or approved equal by ITE or Cutler Hammer.

2.2 CIRCUIT BREAKERS

A. Thermal-magnetic type, tripping free of handle and employing deion principle of arc. Handles shall assume three distinctive positions; `OFF', `ON' and `TRIPPED'.

B. Circuit breaker used for HACR or hid lighting loads shall be UL Listed for their intended purpose.

C. All lugs and breakers shall be rated at 75^{o}C minimum.

D. All new breakers being installed in existing panels shall be compatible with existing panel. Provide all required mounting hardware.

2.3 WIRING METHODS

A. In general, branch circuits shall be No. 12 AWG (minimum) THHN copper. Control wiring and signal circuits may be No. 14 AWG THWN/THHN.

B. Electric room wiring raceways may be installed exposed. Exposed wiring shall be installed in a neat and workmanlike manner with runs plumb and parallel to walls.

C. All wiring shall be supported in accordance with provisions of National Electrical Code and local code requirements and shall utilize approved fasteners and clamps. Conduits secured to walls shall be fastened to wall studs where spacing permits. In all cases, conduits and clamps shall be rigidly secured and free of obtrusions which may cause injuries.

D. Wiring shall be color coded to distinguish between services of different voltages. Use distinctive color for switched conductor wherever possible. Color coding to be as follows:

Voltage	Neutral	Phase A	Phase B	Phase C	Ground
120/208 Wye	White	Black	Red	Blue	Green
277/480 Wye	Gray	Brown	Orange	Yellow	Green

E. All No. 12 and No. 10 branch circuit conductors shall have solid color compound or solid color coating. All neutral sizes shall have solid color compound or solid color coating.

F. No. 8 AWG and larger phase conductors shall have either:

1. Solid color compound or solid color coating.

2. Stripes, bands or hash marks of colors specified above.

3. Colored, pressure-sensitive plastic tape. Tape shall be applied in half overlapping turns for a minimum of three inches for all terminal points, and in all junction boxes, pull boxes, troughs, manholes, and handholes. Tape shall be 3/4-inch wide with colors as specified above. The last two laps of tape shall be applied with no tension to prevent possible unwinding. Where cable markings are covered by tape, apply. Tag all wires at terminal equipment, outlets, terminal cabinets pull and junction boxes, and control center, with Brady "Quick" label tags.

G. Circuit number and panel identification shall be painted on the back of all device plates, on all receptacles and wall switches.

2.4 WIRING DEVICES

A. Switches shall be extra hard use, commercial premium specification grade and comply with Federal Specification W-S 896B and be rated 20 amperes and voltage as dictated by the system and shall not require derating for lamp loads. They shall be approved for control of motors up to 80 percent of the switch rating and shall be quiet AC type. Use single pole, double pole, three-way and/or four-way as shown connected. The color shall be ivory, white, or brown to suit wall finishes and shall be P&S, Leviton, Arrow-Hart, Hubbell, or General Electric.

B. Ground Fault Interrupter devices shall be duplex receptacle type and shall comply with Federal Specifications WC-596G and Underwriters Laboratories Inc. standard 943, Class A. They shall be no more than one and one eighth inch deep with standard terminal screw connections and rated at 20 amperes. The color shall be ivory, white, or brown to suit wall finishes and shall be P&S, Leviton, Arrow-Hart, Hubbell, or General Electric.

C. Device plates: Indoors: .040 inch, brushed type 316 stainless steel.

D. Device plates Weatherproof for outdoor and wet locations: Receptacle covers shall be cast aluminum and shall provide " protection while in use". Provide Intermatic #WP1010MC, WP1010MCH for single gang applications, or approved equal. Weatherproof Switch plates shall also be cast aluminum, UL listed for wet locations.

2.5 CONNECTIONS TO MECHANICAL EQUIPMENT

A. Note carefully all other sections of this specification describing electrical equipment to be furnished in order to fully understand all equipment wiring and motor starting requirements.

B. An enclosed disconnect switch and motor starter shall be furnished and installed for each motor installed unless specifically indicated as furnished under other sections of specifications.

C. All thermostats shall be furnished and installed under Division 15.

D. Furnish and install all power wiring for motors complete from panelboard thru motor starters to motor terminations.

2.6 MOTOR STARTERS AND CONTROLS

A. Install items in accordance with manufacturer's instructions.

B. Set overload devices to suit motors provided.

C. All motors shall be connected with minimum 3 foot length of sealtite flex conduit at motor connection box.

PART 3.0 EXECUTION

3.1 INSTALLATION

A. Switches and receptacles shall be installed in locations shown on contract drawings. Contractor shall study general building plans in relation to space surrounding each device in order that intended work may accommodate all other specified work. Boxes shall be installed in a rigid and satisfactory manner. Support all boxes independent of raceways. Adjacent wall mounted wiring devices, room thermostats or other equipment shall be coordinated and so located either at the same elevation or in line, one above the other. Install conduit, outlets and equipment to clear beams or obstructions. Do not cut into or reduce the size of any load-carrying member without the approval of the Engineer. Check drawings and work of others to prevent interference. Deviations

of work to avoid obstructions shall be done without additional cost.

B. Ground all equipment in accordance with the National Electrical Code requirements and with local ordinances and utility company requirement.

C. Support pull boxes and junction boxes in ceiling from structure and not from raceways or ceiling suspension systems.

D. Use locknuts and insulating bushings at all rigid conduit ends at junction boxes, pull boxes, panel, starters, disconnects, and other boxes.

E. Protect conduit openings and do not pull wire until work which could damage wire has been completed near ends of conduit. All empty raceways shall be furnished with nylon rope.

F. Bend conduits with hickey or bender, where bends are necessary. Do not bend in vise or use a pipe tee for bending.

G. When cutting conduit, square ends, thread, ream and clean.

H. Use Sealtite conduit and fittings in damp places for pumps, motor connections, in mechanical equipment rooms or out of doors for flexible connections.

I. Use gasketed covers and threaded raceway hubs for exterior raceway connections. Use vandal-resistant hardware where accessible to public.

J. Label all safety switches, disconnects, panelboards, motor starters, motor service switches and other equipment with engraved laminated plastic tags, screw attached, not smaller than 3/8 inch high, indicating function served. Letters shall not be smaller than 1/4 inch high and shall be black on white background. Submit proposed designations and sample for approval. Panelboard nameplates shall also indicate the panel and circuit it is fed from as well as Voltage/phase, feeder circuit breaker ampacity and date.

K. No more than three phase conductors shall be installed in a conduit without derating the conductors as per NEC. All sizes given on the plans are for 3 max current carrying conductors, unless specifically detailed otherwise.

3.2 GUARANTEE

A. Unless otherwise specified, guarantee unconditionally for a guarantee period as set forth in General Conditions all materials, equipment, workmanship and installation. During this period, adjust, repair or replace at no cost to Owner any item of equipment or workmanship found to be defective.

(END OF SECTION)

SECTION 16409
MOTOR CONTROL CENTERS – NEMA 3R

PART 1 GENERAL

1.01 SUMMARY

A. This section includes requirements for a motor control center (MCC) and all required control devices as shown on the drawing and specified to be part of the MCC equipment. The MCC shall be 480 V, 3-Phase, 4-Wire, 60 Hz unless otherwise indicated.

B. The motor control center shall have a separate “control panel” section with a Siemens LC-150 control system. See Section 16959 for control requirements.

1.03 STANDARDS

A. Equipment shall be manufactured in a certified ISO 9001 facility and shall be designed and tested to the following standards:

1. UL 845, UL Listed
2. National Electrical Manufacturers Association (NEMA) ICS 18-2001
3. NEMA ICS 2.3 – Instruction for Handling, Operation and Maintenance of Motor Control Centers
4. Candian Standards Association – (CSA) C22.2 No. 245-05
5. Electrical Equipment Manufacturers Association of Canada (EEMAC)
6. National Electrical Code - NFPA 70

1.04 RELATED SECTIONS

A. Section 16959 – Pump Controls.

B. Section 16990 - SCADA

PART 2 PRODUCT

2.01 MANUFACTURERS

A. Low Voltage Motor Control Center shall be Square D by Schneider Electric ® brand Model 6 MCC or approved equa by Cutler Hammer.

2.02 MATERIALS

A. Steel material shall comply with UL 845 and CSA requirements.

B. Each MCC shall consist of one or more vertical sections of heavy gauge steel bolted together to form a rigid, free-standing assembly. A removable 7 gauge structural steel lifting angle shall be mounted full width of the MCC shipping block at the top. Removable 7 gauge bottom channel sills shall be mounted underneath front and rear of the vertical sections extending the full width of the shipping block. Vertical sections made of welded side-frame assembly formed from a minimum of 12 gauge steel. Internal reinforcement structural parts shall be of 12 and 14 gauge steel to provide a strong, rigid assembly. The entire assembly shall be constructed and packaged to withstand normal stresses included in transit and during installation.

2.03 MCC FINISH

A. All steel parts shall be provided with UL and CSA listed acrylic/alkyd baked enamel paint finish or TGIC Powder Coat, except plated parts used for ground connections. All painted parts shall undergo a multi-stage treatment process, followed by the finishing paint coat.

B. Pre-treatment shall include:

1. Hot alkaline cleaner to remove grease and oil.
2. Iron phosphate treatment to improve adhesion and corrosion resistance.

C. The paint shall be applied using an electro-deposition process to ensure a uniform paint coat with high adhesion.

D. The standard paint finish shall be tested to UL 50 per ASTM B117 (5% ASTM Salt Spray) with no greater than 0.125 in (3 mm) loss of paint from a scribed line.

E. Paint color shall be #49 medium light gray per ANSI standard Z55.1-967 (60-70 gloss) on all surfaces unless specified otherwise. Control station plates and escutcheon plates shall be painted a contrasting gray. All unit interior saddles shall be painted white for better visibility inside the unit.

2.04 STRUCTURES

A. Structures shall be totally enclosed, dead-front, free-standing assemblies.

Structures shall be capable of being bolted together to form a single assembly.

B. The overall height of the MCC shall not exceed 90 in (2286 mm) (not including base channel, lifting angle, baffle, or plenum). Base channels, of 1.5 in (38 mm) in height, and lifting angles, of 3 in (76 mm) in height, shall be removable. The total width of one section shall be 20 in (508 mm); (widths of 25 in (630 mm), 30 in (760 mm), and 35 in (890 mm) can be used for larger devices).

C. Structures shall be NEMA/EEMAC type 3R semi walk-in (rainproof).

D. Each 20 in. (508 mm) wide standard section shall have all the necessary hardware and bussing for modular plug-on units to be added and moved around. All unused space shall be covered by hinged blank doors or appropriate cover plate and equipped to accept future units. Vertical bus openings shall be covered by manual bus shutters.

E. Each section shall include a top plate .

2.05 WIREWAYS

A. Structures shall contain a minimum 12 in (305 mm) high horizontal wireway at the top of each section and a minimum 6 in (152 mm) high horizontal wireway at the bottom of each section. These wireways shall run the full length of MCC to allow room for power and control cable to connect between units in different sections.

B. A full-depth vertical wireway shall be provided in each MCC section that accepts modular plug-on units. The vertical wireway shall connect with both the top and bottom horizontal wireway. The vertical wireway shall be 4 in. (102 mm) wide minimum with a separate hinged door. There should be a minimum of 80 $in.^2$ (516 cm^2) of cabling space available for 20-inch-deep sections. Access to the wireways shall not require opening control unit doors. Structures that house a single, full section control unit are not required to have vertical wireways. Those control units must open directly into the MCC horizontal wireways.

2.06 BARRIERS

A. All power bussing and splice connections shall be isolated from the unit compartments and the wireways. The horizontal bus shall be mounted onto a glass filled polyester support assembly that braces the bus against the forces generated during a short circuit. The horizontal bus shall be

isolated from the top horizontal wireway by a two-piece rigid non-conductive barrier. The barrier design shall allow qualified personnel to slide the barriers both left and right, to allow access to the bus and connections for maintenance without having to remove the barrier. Barrier sliding shall occur via an upper and lower track system.

B. The vertical bus shall be housed in a molded glass-filled polyester support that provides bus insulation and braces the bus against the forces generated during a short circuit. These supports shall have openings every 3 in (75 mm) for unit stab-on connections. Each opening shall be provided with a manual shutter to close off the stab opening. These shutters shall be attached to the structure so that when they are removed (to allow a stab connection) they are retained in the structure and are readily accessible for use should a plug-in unit be removed from the MCC.

2.07 BUSSING

A. All bussing and connectors shall be tin-plated aluminum.

B. The main horizontal bus shall be rated at 600 Amp continuous and shall extend the full length of the MCC. Bus ratings shall be based on 65° C maximum temperature rise in a 40° C ambient. Provisions shall be provided for splicing additional sections onto either end of the MCC.

C. The horizontal bus splice bars shall be pre-assembled into a captive bus stack. This bus stack is installed into the end of the MCC power bus to allow the installation of additional sections. The main bus splice shall utilize four bolts, two on each side of the bus split, for each phase. Additional bolts must not be required when splicing higher amperage bus. The splice bolts shall secure to self clenching nuts installed in the bus assembly. It shall be possible to maintain any bus connection with a single tool.

D. Each section that accepts plug-in units shall be provided with a vertical bus for distributing power from the main bus to the individual plug-in starter units. This bus shall be of the same material and plating as the main bus, and shall be rated at 600 Amp continuous. The vertical bus shall be connected directly to the horizontal bus stack without the use of risers or other intervening connectors. It shall be possible to maintain the vertical to horizontal bus connection with a single tool. "Nut and bolt" bus connections to the power bus shall not be permitted. When a back-to-back unit arrangement is utilized, separate vertical bus shall be provided for both the front and rear units.

E. A tin-plated copper ground bus shall be provided that runs the entire

length of the MCC. The ground bus shall be 0.25 in (6.0 mm) x 2.0 in (50 mm) and be rated for 600 A. A mechanical lug shall be provided in the MCC for a #8 -250 kcmil ground cable. The ground bus shall be provided with (6) 0.38 in (10 mm) holes for each vertical section to accept customer-supplied ground lugs for any loads requiring a ground conductor.

F. Each vertical section shall have a vertical ground bus that is connected to the horizontal ground bus. This vertical ground bus shall be installed so that the plug-in units engage the ground bus prior to engagement of the power stabs and shall disengage only after the power stabs are disconnected upon removal of the plug-in unit.

G. The system shall be rated for an available short circuit capacity of 42,000 rms amperes.

2.08 TYPICAL UNIT CONSTRUCTION

A. Units with circuit breaker disconnects through 400 A frame, and fusible switch disconnects through 400 A, shall connect to the vertical bus through a spring reinforced stab-on connector. Units with larger disconnects shall be connected directly to the main horizontal bus with appropriately sized cable or riser bus.

B. All conducting parts on the line side of the unit disconnect shall be shrouded by a suitable insulating material to prevent accidental contact with those parts.

C. Unit mounting shelves shall include hanger brackets to support the unit weight during installation and removal. All plug-on units shall use a twin-handle camming lever located at the top of the bucket to rack in and out the plug-on unit. The cam lever shall work in conjunction with the hanger brackets to ensure positive stab alignment.

D. A lever handle operator must be provided on each disconnect. With the unit stabs engaged onto the vertical phase bus and the unit door closed, the handle mechanism shall allow complete ON/OFF control of the unit. All circuit breaker operators shall include a separate TRIPPED position to clearly indicate a circuit breaker trip condition. It shall be possible to reset a tripped circuit breaker without opening the control unit door. Clear indication of disconnect status shall be provided, by adhering to the following operator handle positions:

1. Handle "On" position must be up or to the left and within 45 degrees of being parallel to the face of the equipment.

2. Handle "Off" position must be down or to the right and within 45 degrees of being parallel to the face of the equipment.
3. The minimum separation between the "On" and "Off" positions shall be 90 degrees.
4. On Circuit Breaker disconnects, the handle "Tripped" position must be perpendicular to the face of the equipment +/- 30 degrees. Minimum separation between "On" and "Tripped" shall be 30 degrees. Minimum separation between "Tripped" and "Off" shall be 45 degrees.

E. A mechanical interlock shall prevent the operator from opening the unit door when the disconnect is in the ON position. Another mechanical interlock shall prevent the operator from placing the disconnect in the ON position while the unit door is open. It shall be possible for authorized personnel to defeat these interlocks.

F. A non-defeatable interlock shall be provided to prevent installing or removing a plug-on unit unless the disconnect is in the OFF position.

G. The plug-in unit shall have a grounded stab-on connector which engages the vertical ground bus prior to, and releases after, the power bus stab-on connectors.

H. Provisions shall be provided for locking all disconnects in the OFF position with up to three padlocks.

I. Handle mechanisms shall be located on the left side to encourage operators to stand to the left of the unit being switched.

J. Unit construction shall combine with the vertical wireway isolation barrier to provide a fully compartmentalized design.

2.09 COMPONENTS FOR TYPICAL UNITS

A. Combination Starters

1. All combination starters shall use a unit disconnect as described in specification 2.08. All starters shall utilize NEMA/EEMAC rated contactors. Starters shall be provided with a three-pole, external manual reset, overload relay for solid state thermal overload units.
2. Provide control circuit transformers shall include two primary protection fuses and one secondary fuse (in the non-ground secondary conductor). The transformer shall be sized to accommodate the contactor(s) and all connected control circuit loads. The transformer rating shall be fully visible from the front

when the unit door is opened.

3. Auxiliary control circuit interlocks shall be provided. Auxiliary interlocks shall be field convertible to normally open or normally closed operation.
4. NEMA/EEMAC Size 1-4 starters shall be mounted directly adjacent to the wireway so that power wiring (motor leads) shall connect directly to the starter terminals without the use of interposing terminals. Larger starters shall be arranged so that power wiring may exit through the bottom of the starter cubical without entering the vertical wireway.

B. Terminal Blocks

1. When Type B wiring is specified, all starter units shall be provided with unit control terminal blocks.
2. Terminal blocks shall be the pull-apart type with a minimum rating of 250 volt and 10 amps. All current carrying parts shall be tin plated. Terminals shall be accessible from inside the unit when the unit door is opened. Terminal blocks shall be DIN rail mounted with the stationary portion of the block secured to the unit bottom plate. The stationary portion shall be used for factory connections, and shall remain attached to the unit when removed. The terminals used for field connections shall face forward so they can be wired without removing the unit or any of its components.
3. When Type C wiring is specified, all starter units shall be provided with unit control terminal blocks as described for Type B wiring along with power terminal blocks for size 1-3 units. An additional set of terminal blocks shall be provided in a terminal compartment located in each section. These terminal blocks shall be pre-wired to the unit terminals so that all field control connections can be made at the terminal compartments.

C. Nameplates

1. Shall be engraved phenolic nameplates for each MCC and unit compartment. Shall be gray background with white letters, measuring a minimum of 1.5 in (38 mm) H x 6.25 in (159 mm) W total outside dimensions.

D. Pilot Device Panel

1. Each combination starter unit shall be proved with a hinged/removable control station plate, which can accommodate up to five 22 mm pilot devices or three 30 mm pilot devices. [The

control station plate can be deleted if no local unit pilot devices are required.]

2.10 Solid-State Reduced-Voltage Starter Unit Construction

A. The soft start controller unit shall be a combination disconnect/soft starter, MCC-style unit. The input circuit breaker shall provide NEC required branch circuit protection. The branch circuit protection shall have an external operator. Wiring between the soft starter and the disconnect shall not be disturbed when removing or installing the soft start controller unit from the MCC. Units shall be of modular construction so that units of the same size can be interchanged without modifications to the MCC structure.

B. All conducting parts on the line side of the unit disconnect shall be isolated to prevent accidental contact with those parts.

C. Soft start controller units rated for standard duty (up to 156 A) shall be plug-on units which connect to the vertical bus through a spring-reinforced stab-on connector. Units rated higher than 156 A shall be connected directly to the main horizontal bus with appropriately sized cable or riser bus.

D. All soft start controller unit interior mounting panels shall be white for better interior visibility.

E. A disconnect operator shall be provided as specified herein.

F. All plug-on soft start controller units shall have a grounded stab-on connector which engages the vertical ground bus prior to, and releases after, the power bus stab-on connectors engage/release.

G. Handle mechanisms shall be located on the left side to encourage operators to stand to the left of the unit being switched.

H. All soft start controller units shall be provided with unit control terminal blocks for use in terminating field wiring. Terminal blocks shall be pull-apart type, 250 V, and rated for 10 A. All current-carrying parts shall be tin-plated. Terminals shall be accessible from inside the unit when the unit door is opened. The stationary portion of the terminal block shall be used for factory connections and will remain attached to the unit when the portion used for field connections is removed. The terminals used for field connections shall be accessible so they can be wired without removing the unit or any of its components.

I. The enclosure shall include a door-mounted digital keypad for adjusting the soft start parameters and viewing the motor, soft start, and fault status without opening the enclosure door.

J. A shorting contactor shall be supplied in each soft start controller unit to reduce temperature rise within the unit and MCC enclosure. The shorting contactor shall be rated to carry the motor full load current during steady state after full voltage has been applied to the motor by the soft starter.

K. Electrical Ratings

1. The soft start controller unit shall be designed to operate from an input voltage between -10% and +10% of nominal voltage rating.
2. The soft start controller unit shall operate from an input voltage frequency range of +/-5%.
3. The soft starter shall be capable of supplying 350% of rated full load current for 20 seconds at the maximum ambient temperature.
4. All soft start controller unit power and control devices shall be rated
5. The silicon-controlled rectifiers (SCRs) shall have a minimum peak inverse voltage (PIV) rating of 1800 Vac. Lower rated SCRs with protection by metal oxide varistors (MOVs) are not acceptable.

L. Protection

1. A microprocessor-based thermal protection system shall be included that continuously calculates the temperature rise of the motor and soft starter and provides:

   A motor overload pre-alarm that indicates by relay contact or logic output that the motor windings have exceeded 110% of their rated temperature rise. This function shall be for alarm only.

   A motor overload fault will stop the motor if the windings have exceeded 125% of their rated temperature rise.

   An electronic circuit with a time-constant adjustable to the motor's thermal cooling time-constant that ensures memorization of the thermal state even if power is removed from the soft starter.
2. The soft starter shall provide line and motor phase loss, phase reversal, underload, stall, and jam protection.
3. The soft start controller unit shall include a shorting contactor which closes after full voltage has been applied to the motor by the soft starter to reduce the current carrying duty on the SCRs. The integral protective features shall be active even when the shorting

contactor is used to bypass the SCRs during steady state operation.

4. All units and options shall be constructed with protection provisions to pass UL 845 short circuit testing criteria at a minimum of 42,000 A short circuit current.
5. Diagnostic faults and soft start status shall be displayed on the door-mounted keypad after a fault condition.
6. The motor must be automatically protected from solid state component failure by one of the following means:

M. Adjustments and Configurations

1. All programming/configuration devices, display units, and field control wiring terminals shall be accessible on the front of the control module. Exposure to control circuit boards or electrical power devices during routine adjustments is prohibited.
2. Digital indication shall provide, as a minimum, the following conditions:

   Soft starter status—ready, starting/stopping, run

   Motor status—current, torque, thermal state, power factor, operating time, power in kW

   Fault status—motor thermal overload, soft starter thermal fault, loss of line or motor phase, line frequency fault, low line voltage fault, locked rotor fault, motor underload, maximum start time exceeded, external fault, serial communication fault, line phase reversal fault, motor overcurrent fault
3. The starter shall be preset to the following for operation without adjustment in most applications:

   Linear (torque-controlled) acceleration ramp of 10 seconds

   Current limitation to 350% of the motor full load current rating

   Class 10 overload protection

   Motor current preset per NEC / NFPA 70 table 430.150 for standard hp motors
4. A digital keypad shall be used to configure the following operating parameters as required:

   Motor full load amps adjustable from 40 to 100% of the controller's rating

   Current limitation on starting adjustable from 200 to 700% of the motor current rating, not to exceed 350% of the soft start rating

   Voltage ramp adjustable from 1 to 60 seconds

   Initial voltage adjustable from 10 to 50% of nominal motor torque

   Maximum start time adjustable from 1 to 250 seconds

   Voltage boost duration adjustable from 0.1 to 1 second

Selection of freewheel or soft stop

Linear (torque-controlled) deceleration ramp time adjustable from 1 to 60 seconds

Threshold to change to freewheel following a soft stop from 0 to 10% of the nominal motor torque

Selection of Class 10, 20, or 30 motor thermal overload protection

5. A digital keypad shall be used configure the following controller parameters as required:

   Assignment of soft start inputs and outputs

   Activation of phase reversal protection

   Reset of motor thermal state

   Return to factory parameter settings

   Activation of self test mode

   Indication of elapsed time in hours of starting, running and stopping

6. Output relays shall provide the following status indications:

   One Form A (N.O.) minimum for indication of trip

   One Form A (N.O.) for indication that soft start is running

7. Additional inputs and outputs shall be available to provide the following status indications:

   Two assignable control inputs for the following functions: external fault input, disable serial link control, 2nd set of parameters, or general fault reset

8. Relay and I/O functions listed above must be isolated with respect to common.

N. Control Options

1. The soft starter's control circuit shall be fed from a fused line supply and be completely independent of the power circuit and separate from relay control logic.
2. The peripheral soft starter control circuitry shall be operated from a control power transformer included within the enclosure.
3. Operator devices shall be door-mounted and shall be (choose all that apply):

   Black START and red STOP push buttons

   Three position H-O-A switch which provides for manual (HAND) start or remote signal

   (AUTO) start from user-supplied relay contacts

   Three position FORWARD/OFF/REVERSE selector switch mounted on the door control island (available with reversing starter only)

Red RUN pilot light illuminated whenever the soft starter is provided a run command and no fault condition is present

Green OFF pilot light illuminated whenever the soft starter is supplied with control power and no run command is present

2.11 QUALITY CONTROL

A. The entire MCC shall go through a quality inspection before shipment. This inspection will include:

1. Physical Inspection of:

   a. Structure.
   b. Electrical conductors, including:

      1) bussing.
      2) general wiring.
      3) units.

2. Electrical Tests

   a. General electrical tests include:

      1) power circuit phasing.
      2) control circuit wiring.
      3) instrument transformers.
      4) meters.
      5) ground fault system.
      6) device electrical operation.

   b. AC dielectric tests shall be performed on the power circuit.

3. Markings/Labels, include:

   a. instructional type.
   b. Underwriters Laboratory (UL)/Canadian Standards Association (CSA).
   c. inspector's stamps.

4. Each device shall be configured and addressed to correspond with software settings.
5. A Read/Write test shall be performed prior to shipment on all network devices including, but not limited to, Overloads, Drives, and Soft Starters.
6. Testing shall be designed to verify system operation and shall include these verifications as a minimum:

   Drawings and Bill of Materials

   I/O addressing

   Correct device operation by I/O address

   Host Communications

   Control Network Interface

7. The manufacturer shall use integral quality control checks throughout the manufacturing process to ensure that the MCC meets operating specifications.

PART 3 EXECUTION

3.01 LOCATION

A. Motor control centers are not to be placed in hazardous locations. The area chosen shall be well ventilated and totally free from humidity, dust and dirt. The temperature of the area shall be no less than 0° C (32° F) and no greater than 40° C (104° F). For indoor locations, protection must be provided to prevent moisture entering the enclosure.

B. Motor control centers shall be located in an area with a minimum of 3 ft (915 mm) of free space in front of front-of-board construction. An additional 3 ft (915 mm) should be allowed in the rear of back-to-back construction. This free space will give adequate room to remove and install units. A minimum of 0.5 in (13 mm) space should be provided between the back of front-of-board MCCs and a wall, 6 in (152 mm) required for damp locations).

C. The motor control centers shall be assembled in the factory on a smooth level surface so that all sections are properly aligned. A similar smooth and level surface shall be provided for installation. An uneven foundation will cause misalignment of shipping blocks, units, and doors. The surface under a MCC shall be of a non-combustible material unless bottom plates are installed in each vertical section.

3.02 PACKING/SHIPPING

A. The MCC shall be separated into shipping blocks no more than three

vertical sections each. Shipping blocks shall be shipped on their sides to permit easier handling at the jobsite. Each shipping block shall include a removable lifting angle, which will allow an easy means of attaching an overhead crane or other suitable lifting equipment.

3.03 STORAGE

A. If the MCC cannot be placed into service reasonably soon after its receipt, store it in a clean, dry and ventilated building free from temperature extremes. Acceptable storage temperatures are from 0° C (32° F) to 40° C (104° F).

3.04 WARRANTY

A. The MCC shall be warranted to be free from defects in materials and workmanship for a period of eighteen (18) months from date of invoice from manufacturer or authorized sales channel.

END OF SECTION

SECTION 16450
GROUNDING

The General Conditions, any supplementary General Conditions and Division 1, General Requirements, are hereby made a part of this section as fully as if repeated herein.

PART 1.0 GENERAL

1.1 SCOPE OF WORK

A. Complete system grounding and bonding as per National Electric Code and as indicated on drawings.

1.2 DESCRIPTION

A. Equipment Grounding:

1. All metallic structures, enclosures, raceways, junction boxes, outlet boxes, cabinets, machine frames, and other conductive items in close proximity with electrical circuits shall be grounded for personnel safety and to provide a low impedance path for possible ground fault currents.

PART 2.0 PRODUCTS

2.1 GROUNDING WIRES

A. Wires shall be UL and NEC approved types, copper, with insulation color identified green, except where otherwise shown on the drawings, or specified.

B. Wire size shall not be less than shown on the drawings and not less than required by the NEC.

PART 3.0 EXECUTION

3.1 GROUNDING

A. Furnish, install and connect ground bond to cold water services and to auxiliary driven ground rods. Bond all non-current carrying metallic parts of equipment, mechanical systems, and building steel. Neutral conductor at main switches shall be grounded. Ground bus shall not be less than size required by National Electrical Code and local codes. Grounding system shall be complete and installed in accordance with all local jurisdictions and Owner's requirements. Ground rods shall be copper clad steel, driven as indicated, or to refusal. Where soil conditions are poor notify the Engineer so that supplemental grounding may be considered. Ground and bond all piping systems within building.

3.2 SECONDARY EQUIPMENT AND CIRCUITS

A. Conduit Systems:

1. Ground all metallic conduit systems.

2. All conduit and raceway systems shall contain a separately insulated

green grounding conductor.

3. Metallic conduit provided for mechanical protection and containing only a grounding conductor shall be bonded to that conductor at the entrance and exit from the conduit. The metal conduit shall not be the sole grounding source.

4. Use grounding bushings for feeder conduits attached through concentric knockouts, regardless of system voltage.

B. Feeders and Branch Circuits:

C. Install green grounding conductors with all feeders and branch circuits. Provide additional Grounding as follows:

1. Receptacle outlets shall have a green pigtail from device to metallic box.

2. Motors and motor controllers shall have a bonding conductor to conduit system.

3. Fixed equipment and appliances shall have a bonding conductor to conduit system.

4. Items of equipment where the final connection is made with flexible conduit shall have a bonding wire.

5. Additional locations and systems as shown on the drawings.

D. Boxes, Cabinets, Enclosures, and Panelboards:

1. Bond the grounding wires to each pullbox, junction box, outlet box, cabinets, and other enclosures through which the ground wires pass (except for special isolated grounding systems other critical circuits show on the drawings).

2. Provide lugs in each box and enclosure for ground wire termination.

3. Provide ground bars in panelboards, bolted to the housing, with sufficient lugs for terminating the ground wires.

E. Motors and Starters:

1. Provide lugs in motor terminal box and starter housing for ground wire termination.

2. Make ground wire connections to ground bus in motor control centers.

3.3 GUARANTEE

A. Guarantee unconditionally as set forth in the General Conditions following acceptance by Owner all work done under this section. During this period, adjust, repair or replace any item of equipment, material or workmanship found to be defective, at no cost to Owner.

(END OF SECTION)

SECTION 16900
SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA) SYSTEM

The General Conditions, any supplementary General Conditions and Division 1, General Requirements, are hereby made a part of this section as fully as if herein.

PART 1.0 GENERAL

1.1 SCOPE OF WORK

A. The Contractor shall furnish all labor, materials, control wiring, relays, equipment enclosures, and perform all work and services necessary for or incidental, to prewire the facility for monitor and alarm of the items specified herein. The existing SCADA Remote Terminal Unit (RTU) electronics and terminal box shall be used.

B. Contract a system integrator for programming. The system intergrator shall be “Global”. No equals.

C. RTU SCADA requirements are identical for both pump stations, except for the smaller pump station (WBR) does not have a pump 5or the two Leachate pumps.

1.2 SUBMITTALS

A. Drawing and Data: In accordance with the procedures set forth in Section 16010, the Contractor shall submit drawings including, but not limited to:

1. Physical drawing showing dimensions of wiring terminal boards and enclosures.

2. Schematic wiring diagrams with each terminal numbered and indicating appropriate alarm or status point.

3. Interconnection and terminal wiring diagrams.

4. Cut sheets on all equipment.

B. Operation and Maintenance Manuals: In accordance with the procedure set forth in Section 16010, the Contractor shall submit operation and maintenance manuals as prepared by equipment manufacturer.

1.3 STANDARDS

A. All components shall be built and tested in accordance with IEEE, UL, FCC, and NEMA standards, as applicable.

1.4 SYSTEM COMPONENTS

A. Wiring terminal board, and enclosure.

B. Wiring and conduit, relays and contacts for the alarm and status points.

C. As-built documentation.

1.5 GUARANTEE

A. The manufacturer will provide a written guarantee for the electrical and mechanical performance of the supplied equipment to be free from defects and workmanship and to remain in good working condition for a period of not less than one (1) year from the date of final acceptance of the project.

PART 2.0 PRODUCTS

2.1 WIRING AND CABLES

A. All wiring shall meet specification Section 16100.

2.2 SCADA TERMINATION ENCLOSURES

A. The existing enclosure shall be reused. Provide Electromate #A1614LH with WOERTZ #3450GR Terminals in existing unit. Quantity as required plus 20% spare capacity.

PART 3.0 EXECUTION

3.1 MOUNTING AND WIRING

A. All enclosures, cables, wiring, connections, and other accessories shall be mounted, wired, and connected to insure installation of a complete and working system.

3.2 ALARM POINTS

A. The following alarms are to be transmitted to the New Design Road water treatment plant or between buildings via the new and existing RTU'S. Transmission will be ended when the alarm condition is eliminated and the operator acknowledges the alarm at the pump station. (Use N/O relays which close upon alarm and remain closed until the alarm condition is eliminated and the alarm reset pushbutton is depressed).

B. The alarms shall be wired to a Termination Panel. Alarm light(s) shall illuminate when an alarm occurs and an AUX contact shall close. The contact shall remain closed until both the alarm clears and the operator hits an acknowledge button. The N/O auxiliary contacts which close upon alarm shall be wired to the RTU terminal board.

3.3 SYSTEM MONITORING/STATUS

A. Provide dedicated N/O and N/C relays for status monitory, as well as dedicated auxiliary contacts on motor starters.

3.4 Automatic Pump:

A. Provide wiring from each well pump motor starter and pump variable speed drive starter to the control panel to start and stop the pump from the RTU when the selector switch is in “Auto” mode.

3.5 Alarm/Status Points.

A. Provide alarm and status points at the existing pump station as follows:

Digital Alarm/Monitoring Point	**Relay Location**	**Relay Contact Operation**
Status Points		
1. Pump #1 Status On/Off	Motor Starter	N/O contact, closes when running
2. Pump #2 Status On/Off	Motor Starter	N/O contact, closes when running
3. Pump #3 (future) Status On/Off	Motor Starter	N/O contact, closes when running
4. Pump #4 Status On/Off	Motor Starter	N/O contact, closes when running
5. Pump #5	Motor Starter	N/O contact, closes when running
6. Leachate Pump #1	Motor Starter	N/O contact, closes when running
7. Leachate Pump #2	Motor Starter	N/O contact, closes when running
Alarms	**Relay Location**	**Relay Contact Operation**
1. Pump #1 Failure/Overload	Motor Starter	N/O contact, closes upon alarm
2. Pump #2 Failure/Overload	Motor Starter	N/O contact, closes upon alarm
3. Pump #3 Failure/Overload	Motor Starter	N/O contact, closes upon alarm
4. Pump #4 Failure/Overload	Motor Starter	N/O contact, closes upon alarm
5. Pump #5	Motor Starter	N/O contact, closes upon

Failure/Overload		alarm
6. Leachate Pump #1 Failure/Overload	Motor Starter	N/O contact, closes upon alarm
7. Leachate Pump #2 Failure/Overload	Motor Starter	N/O contact, closes upon alarm
8. Pump #1	Seal Failure	N/O contact, closes upon alarm
9. Pump #2	Seal Failure	N/O contact, closes upon alarm
10. Pump #3	Seal Failure	N/O contact, closes upon alarm
11. Pump #4	Seal Failure	N/O contact, closes upon alarm
12. Pump #5	Seal Failure	N/O contact, closes upon alarm
13. Pump #1	High Temperature Alarm	N/O contact, closes upon alarm
14. Pump #2	High Temperature Alarm	N/O contact, closes upon alarm
15. Pump #3	High Temperature Alarm	N/O contact, closes upon alarm
16. Pump #4	High Temperature Alarm	N/O contact, closes upon alarm
17. Pump #5	High Temperature Alarm	N/O contact, closes upon alarm
18. High Wet Well – Leachate Pump Station	Flow Switch	N/O contact, closes upon alarm
19. Lag Pump “ON” Leachate Pump	Flow Switch	N/O contact, closes upon alarm

Station

20. Vault Flood	Flow Switch	N/O contact, closes upon alarm
21. High Pond Level	LC150 Controller	N/O contact, closes upon alarm
22. Low Pond Level	LC150 Controller	N/O contact, closes upon alarm

Analog Signals	Device	Type
1. Wet Well Level	Primary Pressure Transmitter Backup	4-20 MA
2. Wet Well Level	Scondary Pressure Transmitter Backup	4-20 MA

On-Off motor control as follows:

Motor Control	Relay Contact Operation
1. Pump #1 On/Off Control	Open Contact = Pump Off
2. Pump #2 On/Off Control	Open Contact = Pump Off
3. Pump #3 On/Off control	Closed Contact = Pump On
4. Pump #4 On/Off Control	Closed Contact = Pump On
5. Pump #5 On/Off Control	Closed Contact = Pump On

3.6 Calibration and Field Tests:

A. Complete calibration and field tests shall be carried out on the completed SCADA system to verify the integrated operation of all components and devices. Tests shall include raising and lowering levels, flows, and activating alarms, etc., to assure that all components are operating properly. Complete functional tests shall be performed on each component of the system. Three copies of system test results shall be presented to the Engineer.

B. Execution shall also be as specified in other Sections of Division 16 as applicable.

(END OF SECTION)

SECTION 16959
PUMP CONTROLS

PART 1 - GENERAL

1.1 Scope

A. This specification is for a Pump Control System used to control and monitor the performance of constant speed pumps that will be used to control one duplex leakage pump station, and the water level in the two storm water management ponds at the Frederick County Landfill.

B. Two control panels will be required. Each control panel will control a separate set of pumps at separate pump stations. The EBR pump station contains 5 pumps, plus a supplemental duplex Leachate pump station. The WBR pump station will control 4 pumps.

C. The manufacturer of the system shall take responsibility for the proper operation / sequencing of the total pump control system.

D. The manufacturer of the system shall take single source, unit responsibility for every component contained within the manufacturer's pump control system.

E. The system shall be constructed by Whel-Tech, Inc. of Catonsville, Maryland or approved equal installer.

1.2 Codes And Standards

A. Electrical equipment, materials and workmanship shall comply with all applicable codes, safety and fire law regulations at the location of the work and shall conform to applicable codes and standards of the organizations listed below.

1. Institute of Electrical and Electronic Engineers. (IEEE)
2. National Electric Code. (NEC)
3. National Electrical Manufactures Association (NEMA)
4. American National Standards Institute. (ANSI)
5. Underwriters Laboratories 508. (UL-508)

PART 2 - OPERATIONAL CHARACTERISTICS

Operation of the Pump Station Controller shall be as described in the following paragraphs.

2.1 Design Data – Storm Water Pumps

The pump control system shall be capable of operating five pumps (two low flow pumps and 3 high flow pumps) in a constant speed mode in order to convey storm water out of an existing storm water pond without causing a over-flow,

regardless of system demands.

The system controller shall supervise all sequencing, pump combinations, non critical annunciation, system testing, system monitoring and back-up systems, and overall system status and control.

A. Sequence Of Operation

As water levels rise, the lead low flow pump operates alone and maintains adequate flow. As the wet well level continues to rise and reaches the lag low flow pump start level the lag pump will start and work with the lead pump in gaining control of the wet well. If the wet well continues to rise both low flow pumps will shut down and the lead high flow pump shall start. Should the wet well level continue to rise, the lag high flow wet well pump shall start, should the wet well level continue to rise with two high flow pumps running the third high flow pump shall star. If the level should continue to rise 2’ above this level is a high level alarm shall activate and the pump control shall alternate to the backup control system.

On decreasing wet well level, the pump sequence will reverse and the pumps will shut off in reverse starting order. As the wet well level decreases and the stop lag pump level is reached the lag pump will be stopped. The lead pump will continue to run untill the level decreases sufficiently to reach the stop lead pump level. Once the lead stop pump level has been reached the lead pump will be stopped and the pumps shall alternate.

2.2 Primary System Operation

The system shall be designed to produce an outflow from the storm water pond, in an efficient manner, to prevent overflowing. The primary system shall start the pumps as required based on the secondary pressure transducer (1) for high level float, (1) for start lag float pump, (1) for start lead float pump and (1) for stop pumps settings.

- The pumps shall sequence on in a selected time delay manner.
- The pumps will stop when the level reaches the "stop" pump level and the pumps shall then alternate.

B. Hand Off Automatic (HOA) Switch for each pump shall be provided.

2.3 Back-Up System and Redundancy:

A. Backup System

Failure of the pump controller transducer will cause the storm water pond level to rise to the high level Standby-controls “ON”. The standby system will lock out all other controls. The primary system shall be locked out until manually reset. The standby system shall operate similar to the primary system, but only control the high flow pumps.

PART 3 - EQUIPMENT DESCRIPTION

3.1 Motor Control (Starters, Contactors) – See Section 16409

3.2 Alarm Horn & Beacon

The panel shall have a red/amber alarm beacon and audible horn. The beacon shall be mounted on top of the panel. The alarm beacon shall be rated 120 VAC, 40/60W, and shall illuminate/flash and the audible alarm shall sound to indicate an alarm condition exists.

3.3 Relays

Relays shall be of the plug-in design and have a transparent, polycarbonate dust cover to protect the contact surfaces from airborn dust and other contaminats. All relays shall have a minimum of 2PDT contacts and a molded nylon coil rated for continuous duty operation on 24 and 120VAC. Relay contacts shall be rated for 10A at 300VAC with .187 quick connect terminals.

Relay sockets shall be of the (.187) eleven (11) blade design and have screw terminals with self-lifting clamps. Terminal identification numbers shall be visible on the sockets

3.4 Seal Failure Relays

Seal Failure relays providing adjustable resistance sensing circuitry from 0 to 250,000 ohms for each pump shall be supplied. Upon activation, the seal failure relay shall not shut down the pump but shall activate an alarm that shall be displayed on the graphical screen display. The moisture sensing probes shall be supplied and installed in the pumps by the pump manufacturer.

3.5 Over Temperature Sensing Relays

Pump over temperature (manual reset) sensors located in the pump motor shall be supplied for each pump. When activated, the alarm shall be displayed on the graphical screen display.

3.6 Dry Contacts

Form “C” Dry contacts shall be supplied for power failure, high level alarm and float backup enabled conditions.

3.7 Phase Monitor Relay

A three phase monitoring relay shall be connected to the incoming side of the power input terminals. The unit shall annunciate the status of incoming power and monitor loss of phase, phase reversal, under voltage. A special user-friendly adjustment panel allows the operator to make adjustments to phase imbalance, low and high voltage trip points, individually adjustable trip and restart delays and

offers a selectable restart setting.

3.8 Convenience Receptacle

A GFCI convience receptical shall be provided. The unit shall have polarized blades for two (2) or three (3) wire receptacles. The unit shall require a reset after any ground fault interruption.

3.9 Heater with Thermostat

The control panel shall be equipped with a panel heater to minimize the effects of humidity and condensation. The heater shall include a thermostat.

3.10 Control Circuit Transformer

Nominal control voltage not to exceed 120V.

Control power transformers (CPT) shall be mounted inside the enclosure.

Overcurrent protection shall be supplied on both the line and load sides. Line protection for all step-down transformers shall be provided.

Transformers to be sized for a minimum of 25% extra capacity under full load conditions.

One secondary line shall bEGrounded for operator safety.

Transformers shall be manufactured by Eaton.

3.11 Surge Protection

Line-to-line and line-to-ground protection shall be provided. This protection shall exceed the requirements of ANSI / IEEE standard C62.1-1984 section 8.6.1. and 8.7.3 by a factor of at least 300%.

Voltage clamping time shall be less than 5 nanoseconds with a maximum surge current of 30,000A RMS at a clamping voltage 552VAC.

Clamping voltage levels shall be specifically sized for the applied system voltage as well as the winding and grounding configuration of the supply transformer. These voltage levels will be chosen to assure minimizing system voltage excursion.

One surge arrestor shall be supplied at the incoming service to the control panel.

3.12 Primary Pump Controller

A. Two Siemens #LC150 PUMP CONTROL –UNITS shall be furnished for each pump station for monitoring and automatically controlling the five (5) pumps in a pump *down* mode of operation in response to *Level* process

variable as based on preconfigured setpoints. Unit shall communicate station status and alarms to the existing Motorola RTU.

B. The PUMP CONTROLLER shall be a standard, catalogued product of a water and wastewater pumping automation equipment manufacturer regularly engaged in the design and manufacture of such equipment. The PUMP CONTROLLER shall be specifically designed for water and wastewater pumping automation utilizing built-in preconfigured control and telemetry strategies allowing pump up or down mode pump control of 1 to 3 pumps. "One of a kind" systems using custom software with a generic programmable controller will not be acceptable.

C. The operating program shall be resident in non-volatile FLASH memory and include full-scale ranging and pump-up/down determination. The controller shall be arranged to operate up to three (3) pumps plus high and low (analog) alarms. The ON and OFF adjustments of each pump and alarm setpoint shall be full-range adjustable through use of an authorized operator access code and a keypad. The controller display shall show the operation of each control stage.

D. The controller shall include keypad adjustable on-delay timing logic to provide staggered pump starting following a power failure condition. Keypad adjustable off delay timing for each pump control stage shall provide smooth transition between control stages.

E. The PUMP CONTROLLER shall be able to operate on either 120 AC or 10–30 VDC power sources. The unit shall be battery backed to provide continued system monitoring and alarm annunciation in the event of primary power failure. Unit shall have built in battery charging circuitry to maintain and charge battery. Battery shall be sized to provide a minimum of 4 hours of back up power. Back up battery power will extend to necessary process sensors, local alarm lights, horns and telemetry equipment. A power on LED shall be built on board providing local indication that power is available to the unit.

F. The PUMP CONTROLLER shall be furnished with a user friendly “View-At-A-Glance™” operator interface allowing adjustment and viewing of all system parameters and status. The operator interface shall be NEMA 4 rated suitable for front door mounting including locations requiring wash-down and moisture protection.

1. The process variable signal, Pump 1, 2, & 3 On/Off and High & Low Setpoints, shall be displayed simultaneously via front panel mounted long lasting Ultra Bright LED bar graphs. These bar graphs shall be vertically mounted in parallel fashion to provide relational viewing of all setpoints vs. the measured process. Each display column shall have a minimum of 40 segments of resolution. Each setpoint column shall have a status LED mounted on top of the associated setpoint providing indication of setpoint activation status. Units that require operator action to view the above

parameters are not acceptable.

2. To assure the highest resolution and accuracy, the process display shall be configured to display the full range of the actual measured process. Range can also be offset allowing display of a pressure or level range that does not start at zero. The display ranges shall be field configurable.

3. System Pump On/Off and Alarm setpoint parameters shall be easily adjustable via individual up and down pushbutton arrows located next to the associated setpoint display column(s).

4. The unit shall have a built in process simulation capability allowing the operator to verify system operation by forcing the process variable up or down via pushbutton arrows located next to the process display. To prevent accidentally leaving the unit in simulation mode, the PUMP CONTROLLER shall be configured to automatically restore monitored process display within 2 minutes after last keypad usage or immediately upon operator initiated restore.

5. The display unit shall incorporate a high contrast LCD panel allowing for viewing of higher level functions including the following:

   a. Process display of the full scale process range.
   b. Time and Date Stamped Alarms & Events
   c. Pump Statistics (Including Run Time, Number Of Starts, Daily Average Number Of Starts)
   d. System diagnostics
   e. Controller Security
   f. Unauthorized Station Entry Detection

G. The PUMP CONTROLLER shall provide on board 24 VDC loop power output for external loop powered sensor. A built-in Analog Supply Voltage Status LED shall indicate availability of loop power. Unit shall be able to monitor a user selectable – 4-20 mA or 0-10 Volt analog input representing the process to be controlled. The analog digital conversion shall not be less than 16 bit to allow accurate measurement of the process variable. The analog input circuitry shall provide optical isolation from the main board to the field device. A minimum of 1000 volts electrical isolation shall be required. The Analog process signal shall be displayed locally via 40 segment vertical LED display and the LCD digital display as specified above. This signal shall also be available for telemetry transmission.

H. The PUMP CONTROLLER shall have the ability to monitor up to 16 digital inputs to be used to provide monitoring of local station status. Each discrete input shall provide optical isolation from the main board to the field device. A minimum of 1500 volts electrical isolation shall be required. An on board LED shall be provided indicating that digital Input isolation is not compromised. All discrete inputs shall be available for telemetry

transmission. The following inputs shall be monitored:

1. Pump 1, 2, 3, 4, 5 Run – This signal shall be used to provide local display of pump run status, pump total run time, pump average daily starts. For each pump.

2. Pump 1, 2, 3, 4, 5 In Auto – This signal shall be used by the controller to determine pump availability. A pump in this mode cannot be called into operation.

3. Pump 1, 2, 3, 4, 5 High Temperature/Seal Failure – This signal shall be used by the controller to disable the pump required when a High Temperature is the cause of the failure, and provide local alarm display. Controller shall be able to differentiate alarm. A Seal Failure shall not disable pump operation.

4. High & Low Pressure – This signal shall be used by the controller to provide back up control of the pumps in the event of primary (analog) sensor failure.

5. Pump Inhibit – This signal shall be used by the controller to inhibit pumps from operating.

6. Power Quality – This signal shall be used by the controller to disable pumps in the event incoming station power is unsuitable for use as determined by an optional external power monitoring device.

7. Door Switch & Door Acknowledge– These signals shall be used by the controller to monitor station access as detected by an optional external door/limit switch an optional external alarm disabling switch.

8. Alarm Silence – This signal shall be used by the controller to monitor an optional external silence push button and will temporarily disable the alarm horn output.

I. The PUMP CONTROLLER LCD shall operate in a manual scrolling menu mode with the various displays shown in sequence as selected by the keypad's up/down arrow keys. The display shall indicate the specific function entered on the keypad to confirm that selection of a particular output or other function from the keypad during adjustment or review routines.

J. The PUMP CONTROLLER shall be protected from unauthorized changes via built-in system security. The unit shall support 3 levels of security in a hierarchical structure allowing different levels of access to the PUMP CONTROLLER for differentiation of desired assess levels to include Operator, Maintenance, & Supervisory access levels.

K. The PUMP CONTROLLER shall provide outputs for interface to local pumps and alarm annunciation equipment. Relay isolated contact outputs

for activation of Pump 1, Pump 2, Pump 3, Common Alarm and Alarm Horn shall be provided. Each contact shall be rated for a minimum of 10 amps at 120 VAC or 5 Amps at 240 VAC. Open collector outputs for Low and High Level Alarm shall be provided for interface to off board monitoring equipment. Open collector outputs shall have a minimum operating range of 5-30 VDC @ 100 mA.

L. The PUMP CONTROLLER shall provide s 4-20 mA output signal for interface to external equipment including VFDs, Chart Recorders or other monitoring devices. Analog output can be configured to provide output representing process variable for retransmission or as a process control output for interface to VFDs, Valves, or other process controlled device.

M. The PUMP CONTROLLER shall support contact closure inputs from float or pressure switches representing high and low (*Level/Pressure*). The PUMP CONTROLLER shall annunciate these inputs as alarms and use them to provide back up control in the event the primary (analog) sensor fails. Unit will provide local alarm indication and utilize the inputs to cycle pumps on and off to maintain system operation.

N. The PUMP CONTROLLER shall have built-in standard operator adjustable alternation functions allowing for sequencing and equalizing wear of the pumps. The following alternation sequences shall be supported.

1. Fixed

2. Rotary

3. First On First Off (FOFO)

4. Utilize One Favor Others (UOFO)

5. Emergency Mode

O. The PUMP CONTROLLER shall include built-in Pump Failure detection logic. In the event the pump has been called into operation and the pump run signal is not received within a pre-adjustable time period. A motor failure shall be produced. The failed motor shall be disabled, an alarm shall be displayed and the next available pump based on the selected alternation sequence shall be requested to start.

P. The controller shall include built in site intrusion detection logic that will monitor an external sensor (motion sensor, door switch, etc…) and allow authorized access to the station via controller keypad entry of proper security code or access level. The intrusion system upon detection of entry, will allow a preset amount of time for the operator to go the controller keypad and enter the proper code. When the operator logs out and leaves the facility, the controller shall allow a preset amount of time for the operator to get out before re-arming.

Q. In addition to the pump and alarm control capability, the controller shall provide alarm annunciation. The controller shall, upon the occurrence of an alarm, sound an audible device and flash the alpha-numeric display. The display will indicate the alarm description, complete with the time and date of the alarm occurrence. An acknowledge pushbutton shall be provided to allow silencing of the audible device while the digital display will continue to show the alarm function, complete with time and date information, until the condition has cleared. A built-in alarm and status historian shall retain the last 100 time and date stamped events providing a historical record of recent activity.

R. The PUMP CONTROLLER shall include a volumetric lift station flow and pump performance monitoring capability allowing station flow measurement without the use of an in line flow meter. In addition to flow measurement, the PUMP CONTROLLER shall provide pump performance related information. Pump station flow and pump performance data shall be viewable locally through built in LCD or available for telemetry transmission to master station. The following information is to be provided:

1. Average Station Influent Flow Rate
2. Maximum Station Influent Rate (K Gal) w/Date & Time
3. Current Day Total Effluent Flow (K Gal)
4. Previous Days Total Effluent Flow (K Gal)
5. Average Daily Effluent Flow (K Gal)
6. Maximum Daily Effluent Flow (K Gal) w/Date & Time
7. Total Station Effluent Flow (K Gal)
8. Average Flow Rate Pump 1, 2, 3 Over All Cycles (GPM) – Each Pump
9. Average Flow Rate Pump 1, 2, 3 Over Last Three Cycles (GPM) – Each Pump
10. Total Flow Pump 1, 2, 3 (K Gal) – Each Pump
11. Flow Rate Pumps 1, 2 (K Gal)
12. Flow Rate Pumps 1, 3 (K Gal)
13. Flow Rate Pumps 2, 3 (K Gal)
14. Flow Rate Pumps 1, 2, 3 (K Gal)

15. Pump 1, 2, 3 Low Flow Rate Alarm (Setpoint) – Each Pump

16. Pump 1, 2, 3 Run Time – Each Pump

17. Pump 1, 2, 3 Number Of Starts – Each Pump

18. Pump 1, 2, 3 Average Number Of Starts – Each Pump

S. The PUMP CONTROLLER shall have one (1) RS-232C serial communications port that shall be available for telemetry communications. The RS-232 serial port shall support open communication standards including as a minimum, MODBUS RTU or ASCII and USFilter Open. Unit shall support communication data rates of 1,200 to 38,800 baud rates. On board communication diagnostic LEDs shall be available to provide indication of communications activity for verification and troubleshooting.

T. Unit shall be constructed for industrial applications for use in harsh environments. Unit shall have a Temperature Operating range of -40 to + 85 Deg C, and be able to operate in environments with 10-90% non condensing humidity. Unit shall be UL Listed and in compliance with FCC part 15 Class A emissions and CE IEC61000 Surge Withstand certifications.

U. All connections shall be made via plug-in terminal blocks with a minimal rating of 10 Amps, 300 Volts and capable of accepting 30-12 AWG wire.

V. It is the intention of this specification that a standard controller/transceiver be provided, with all of the control and communications features described as a fully-integrated assembly. The controller shall be a Siemens/U.S. Filter Control Systems LC150. A PLC with operator interface will not be considered an equal.

3.13 Secondary Pump Control

A. The secondary control system shall consist of a pressure transducer wired to a secondary Siemens LC150 controller that will operate the three (3) high flow pumps.

B. The primary system shall be disconnected when the secondary system takes over. The primary system shall remain un-active until manually reset.

3.14 Primary Level Sensor

A. The Submersible Pressure Transducer shall be specifically designed to meet rigorous environments encountered in level measurement applications. It shall provide repeatable, precision depth measurements under the most adverse conditions.

B. This transducer shall incorporate an isolated diaphragm sensor which is

specifically designed for use with hostile fluids and gasses. The sensor will utilize a silicon pressure cell that has been fitted into a stainless steel housing with an integral, compliant stainless steel barrier diaphragm. The sensor assembly shall be housed in a rugged 316 SS case that provides for a variety of pressure inputs as well as electrical output connections.

C. It shall have a static accuracy of +/- 1% FSO BFSL:

D. Construction shall be Welded 316 SS construction.

E. It shall be Datalogger compatible.

F. The transducer will be fully temperature compensated.

G. The Submersible Pressure Transducer shall be Healy-Ruff A1000 or equal.

3.15 Back Up Level Sensor – Match Primary Sensor

A. Wire to a separate LC150 controller.

3.16 Leachate Pump Station Controls

A. The control panel for the EBR pump station shall also house the controls for a separate Leachate duplex pump station. The controls shall consist of a Healy-Ruff float-pak controller wired to the existing four (4) pump station float switches.

B. The system shall be a pre-engineered packaged controller with the following standard features.

1. Simplex or Duplex Operation
2. Adjustable Lead and Lag Start Delays
3. Short Cycle Prevention
4. 2-Pump Alternator with Selector Switch

    a. 1-2
    b. Auto
    c. 2-1

5. 5 Float Inputs (Intrinsically Safe) “Fail Safe” or Normally Closed, or Normally Open

    a. High Level Alarm
    b. Start Lag Pump
    c. Start Lead Pump
    d. Common Stop
    e. Low Level Alarm

6. Common Audible Alarm Output with Silencer

7. Indicator Lights (LED)

   a. Float Status
   b. High Level Alarm
   c. Low Level Alarm
   d. Pump 1 Called
   e. Pump 2 Called
   f. Alternator Status

8. Alarm Outputs

   a. High Level
   b. Low Level

9. Remote Float-Test Panel (Optional)

   a. Status Lights
   b. Simulation Switches
   c. Sequence Selector

10. Parts and Ordering Information

Description	**Part Number**
Float-Pak Controller	962004-013
Float-Pak Test Panel	962004-014

PART 4 - QUALITY ASSURANCE

4.1 Manufacturer's Experience

The manufacturer of the control system shall be certified by Underwriters Laboratories (UL) as being a UL 508 listed systems panel manufacture certified to install a serialized label for quality control and insurance liability considerations.

The manufacturer of the control system must submit documentation verifying at least 10 years of experience in manufacturing constant speed control systems of a similar size and scope.

The manufacturer of the control system must submit to the Consulting Engineer documentation proving experience in successfully designing and manufacturing at least 10 similar systems of a similar scope.

4.2 Manufacturer's Quality Control

The complete control system, shall be functionally tested at the manufacturers facility and certified as a complete system to assure proper operation per specification in order to minimize costly field changes.

All components must be mounted with stainless steel hardware.

4.3 Manufacturer's Approval

Manufacturers listed in this specification do not constitute approval. All controls must have the capabilities and functions as outlined in the following paragraphs.

4.4 UL Approvals

All components that make up the system shall meet UL (Underwritters Labatories) standards and bear a UL label. The system enclosure shall also bear the UL label certifying that the system meets all L requirements.

PART 5 - SUBMITTAL REQUIREMENTS

5.1 Substitutions

The Engineer will consider proposals for substitution of materials, equipment, methods, and services only when such proposals are accompanied by full and complete technical data and all other information required by the Engineer for the proposed substitution.

Substitution of materials, equipment, methods, and/or services is not allowed unless such substitution has been specifically approved by the Engineer.

Where the phrase "Or Equal", "Pre-approved", or "Pre-approved equal" occurs in the specification, do not assume that any materials, equipment, methods, or services will be approved as equal unless the item has been specifically pre-approved by the Engineer.

5.2 Shop Drawings

All drawings are to be of "computer generated" class, 81/2" X 11"in size, and bound.

All equipment and materials shall be new and shall be specifically designed for the function herein.

Approval for fabrication and installation will be made only after submittal and review of all shop Contract Documents. The minimum information required for approval shall include eight (8) sets of the following.

Computer generated, 3-line electrical diagram of the power and control system.

Complete electrical schematics detailing every wire and connection within the system as well as all field connections.

Bill of material and product data sheets on all high voltage components (>120VAC), drives, switches, and other critical/important components.

Detailed drawings of the enclosure (size, construction, entry/ exit, and mounting).

Exploded detail of every face plate, light, switch or meter mounted on the exterior of the enclosure.

5.3 Record Documents

The following documents shall be provided:

"AS-BUILT" DRAWINGS: 8 sets of "Shop Drawings" are to be supplied and marked in colored ink as depicting "As-built" conditions. These are to include any field modifications made by the authorized start-up personnel during installation, start-up, or testing.

Original copy of the final Q.C. report.

Operation and Maintenance Manuals: the control system manufacturer shall supply a complete and detailed operation and maintenance manual prepared for this system.

PART 6 - WARRANTIES

6.1 Components

As a minimum, all components in the specified control system shall carry a comprehensive, parts only, twelve (12) month guarantee against defects in workmanship and material from the date of final inspection and acceptance, not to exceed 18 months from the date of shipment from the manufacturer's facility.

PART 7 - EQUIPMENT IDENTIFICATION

All electrical equipment shall be identified in accordance with these specifications.

All identification labels, both within the enclosure and external, shall be laser-screened laminated mylar.

All control wiring shall be numbered on each termination.

Screw-in type, engraved nameplates or laser-screened laminated mylar shall be provided to identify all individually mounted push buttons, rocker switches, lights, meters, disconnect switches, circuit breakers, motor starters, transformers, relays, fuses, phase monitors, surge arrestors, and any other equipment for which identification is required for eventual service or replacement. This includes the appropriate equipment within the cabinet. Embossed tape is not acceptable.

PART 8 - EXECUTION

8.1 Field Installation And Start-Up

A. THE CONTRACTOR

The Contractor shall include in his bid the services of a trained representative for whatever period of time, assuming 1 trip, is required to inspect, start-up, test the control system, and instruct plant personnel in the proper maintenance and operation of such equipment.

B. THE OWNER

The owner of this equipment shall supply any personnel to assist the start-up crew which are required to oversee or perform actual work if so required by labor/credit contracts. This cost shall be born by the Contractor.

C. THE MANUFACTURER

Prior to final approval, the manufacturer shall submit a letter certifying that the installation has been tested, and functions as per the plans and specifications.

(END OF SECTION)